# DEVELOPMENT OF BUNOFEE SAMOSA FOR JASMINE RICE FLOUR

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MR. HUSSEIN MOHAMED

ID: 5045113

A special project submitted to the faculty of Biotechnology, Assumption University of ABAC in part of the requirement of degree of

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SPECIAL PROJECT

# DEVELOPMENT OF BUNOFEE SAMOSA FOR JASMINE RICE FLOUR

BY

MR. HUSSEIN MOHAMED

2013

**Title : Development of Bunoffee Samosa from jasmine rice flour**

**By : Mr. Hussein Mohamed**

**Advisor : Dr.Aussama Soontrunnsrudrungsri**

**Level of study : Bachelor of Science**

**Department : Food of technology**

**Faculty : Biotechnology**

**Academic Year: 2013**



Aussama

_____ Advisor

(Dr.Aussama Soontrunnsrudrungsri)

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# ABSTRACT

The goal of the project is to develop a new type of veggie samosa wrap that contain jasmine rice flour ration in it and to find the maximum acceptable amount of jasmine rice flour in samosa that consumer would approve. Jasmine rice flour was purchased from Kasetstart University commercially. Next, the same flour was used to replace all purpose flour as 0%, 10%, 20%, 30%, 40% and 50% in the formula during preliminary preference study. After preliminary stretching preference 0%, 10% and 20% of the flour was chosen for preference liking test, concluding that the amount of jasmine rice flour need to be adjusted. There most people preferred 20% ,then it was taken again another study to obtain the highest preference again and with just about test .the product was well accepted by the consumers (85%),that because it was new to people idea and was not traditional one and since it was fried with oil it tend to stain the hand with oil. Moreover, supplement jasmine rice flour tend to increase the nutrition value and calories in the samosa, and however, this may affect the texture of product. And the cost of the product will be 7 baht.

# ACKNOWLEGMENT

First and foremost, I would like to thank to my adviser of this project, Dr.Aussama Soontrunnsrudrungsri for the valuable guidance and advice. She inspired us greatly to work in this project. Her willingness to motivate us contributed tremendously to my special project.

I also would like to convey thanks to Dr.Aussama Soontrunnsrudrungsri (Aj. Nam) for showing us some example that related to the topic of my project, besides, we would like to thank the biotechnology Faculty University for providing us with a good laboratory facilities environment to complete my work.

Also, we would like to take this opportunity to express my gratitude to the Dean of the biotechnology faculty, technical laboratory and other faculty members who also help me if there were any question.

Last but not the least, an honorable mention goes to our families and friends for their understandings and supports on my in completing this project. Without helps of the particular that mentioned above, I would face many difficulties while doing this project.

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# THE INTRODUCTION

Samosa is a stuffed pastry and a popular traditional snack in South Asia, Southeast Asia, Central Asia, the Arabian Peninsula, the Mediterranean, Southwest Asia, the Horn of Africa, North Africa and South Africa especially Somalia my country , Eritrea and Ethiopia, where they are known as samosa. While samosa can be eaten any time of the year, they are usually reserved for special occasions such as Ramadan, during fasting time also in Christmas.

It generally made of wheat flour and consists of a fried or baked triangular, semi-lunar or tetrahedral pastry shell with a savory filling, which may include spiced potatoes, onions, peas, coriander, and lentils, or ground beef or chicken. The size and shape of a samosa as well as the consistency of the pastry used can vary considerably, although it is mostly triangular. Also, during the fast month and October it is quite common to see samosa around when you are looking at the dessert department. Usually there are varieties of puffs and samosa which is the same family of the puffs. Deep fried and usually with meat and potatoes, but if you would like to have something which is much refreshing which is much refreshing with mix of crunchiness, then I would recommend to have vegetable samosa for both vegetarian and non-vegetarian people.

Figure1: samosa shape

# OBJECTIVES

1. To optimize samosa wrap from composition of jasmine rice flour and wheat flour
2. To formulate filling samosa using banana and caramel.
3. To determine the chemical composition of samosa made from composite flour.
4. To investigate consumer acceptance of the desert samosa from composition flour.

# LITERATURE REVIEW

## 1. Samosa

Historically samosa many people believe that samosa travelled its way to India via the ancient trade routes of Indian by the mecerdai. And studies from the Oxford Companion Food should that the Indian samosa is known for the whole family as stuffed pastries or street dumplings. (Dewan, 2011)

However, nowadays samosas are small, crispy, flaky pastries that are usually deep-fried for several minutes in vegetable oil. Each country has its different customs of cooking for instance. Samosa is cheap and easy to make. Whether you make meat samosas or chicken samosas, make your own pastry or buy the pastry ready-made, samosas are always appetizing. Served with tea, they form the basis of the perfect snack. There is variation of the name for instance Samosa (Hindi) is name used in South Asia and South East Asian countries like Nepal whereas it is called samosa among Arabs, Ethiopians, Somalis (Somali: sambuusa). (Arnold & Roger, 2011)

And because of the prominent of the samosa different regions around the world have significant different methods of cooking and preparing it.

### 1.1 Samosa Horn of Africa

Horn of Africa countries such as Somalia Eritrea Ethiopia and Djibouti use samosa as staple food in their cuisine where they are known as *sambusa*. The fact that they can be eaten any time of the year, but people tend to usually reserved them for special occasions, such as Ramadan, Christmas and EID for Muslim country time more often.

### 1.2 Samosa in Thailand

In some part, in Thailand samosa is unheard of in restaurant. But Thai curry samosa is very in getting popular Thailand streets. The chef prepares and bends this can of appetizers with ginger flavors of Thailand and with the curry spices of India. Each perfectly crispy triangle-shaped is filled with peas, carrots or corn and then seasoned with spices and they cost around 10 baht each in places like chakrapet Road, next to India Emporium and little cheaper for some street venders and Myanmar and Indian restaurants.

**1.3 Process of Samosa**

**2. Jasmine Rice**

Jasmine rice is a variety of long grain rice that's native to Thailand and is similar to Basmati rice. It has a nutty flavor similar to that of popcorn and isn't as sticky as other types of rice. Jasmine rice is commonly used in stir-fry dishes, desserts. In 2004, the United Nations ushered in The International Year of Rice with the catchphrase, "Rice is life." Rice, the most basic fundamental food for many people around the world, and provides an inexpensive, its source of nutrition can be found and cultivate in many regions where other food may be a deficiency in quantity. (The Temple of Thai, 2013)

**2.1 Health Benefits**

One of the well-known jasmine rice benefits is that it stops constipation problems especially when combined with drinking plenty of water. Additionally, the vitamins and minerals within the rice variety and have powerful cancer-fighting properties, these nutrients are also beneficial in improving and maintaining good skin health. Furthermore, jasmine rice contains complex carbohydrates that help in providing instant energy. It also has sodium-free and low fat and aid in weight loss and maintaining good cardiac health (diet health club, 2012) (Elizabeth, 2011)

**2.2 Low-Protein Staple Food**

According to a study in 2005 on jasmine rice says that despite its modest protein content, eating jasmine rice is indispensable due to essential contain essential amino acids not produced in the human body that maintain health, functioning muscles and metabolism. (Elizabeth, 2011)

**2.3 Health Concerns**

We all now that starch is the primary component in white jasmine rice as such, temporarily raise insulin and blood sugar levels. Therefore, a diet high in refined foods, such as white rice, may increase the risk of Type 2 diabetes. Brown rice, on the other hand, poses no increased risk toward this type of diabetes, according to Health notes (Diet health club, 2012), (Elizabeth, 2011)

### 2.4 Rice milling Process

First step is cleaning and grading where foreign materials are eliminated by sifting and grading machine. Next comes dehusking, where the outer part of the grain is removed by husking machine which carefully adjusted to evade damage to the grain. Third is polishing where is the bran is extracted and then polished to white. Fourth is sorting using color-sorting machine to remove defective grain color. Last part is packing.

### 2.5 Rice Quality

Jasmine rice must be 92% for a common standard for export and standard domestic use with long and short grains ranging (6.6-7 mm) and (6.2-6) respectively. Whole kernel is not less that 60%. The size of head rice is 0.8mm. Chalky kernels and white glutinous are not exceeding 3% and 1.5% respectively. Finally, the milling degree is excellence. (Kamphaengphet Export, 2010)

## 2. Jasmine Rice Flour

### 2.1 Rice Flour Technical Data

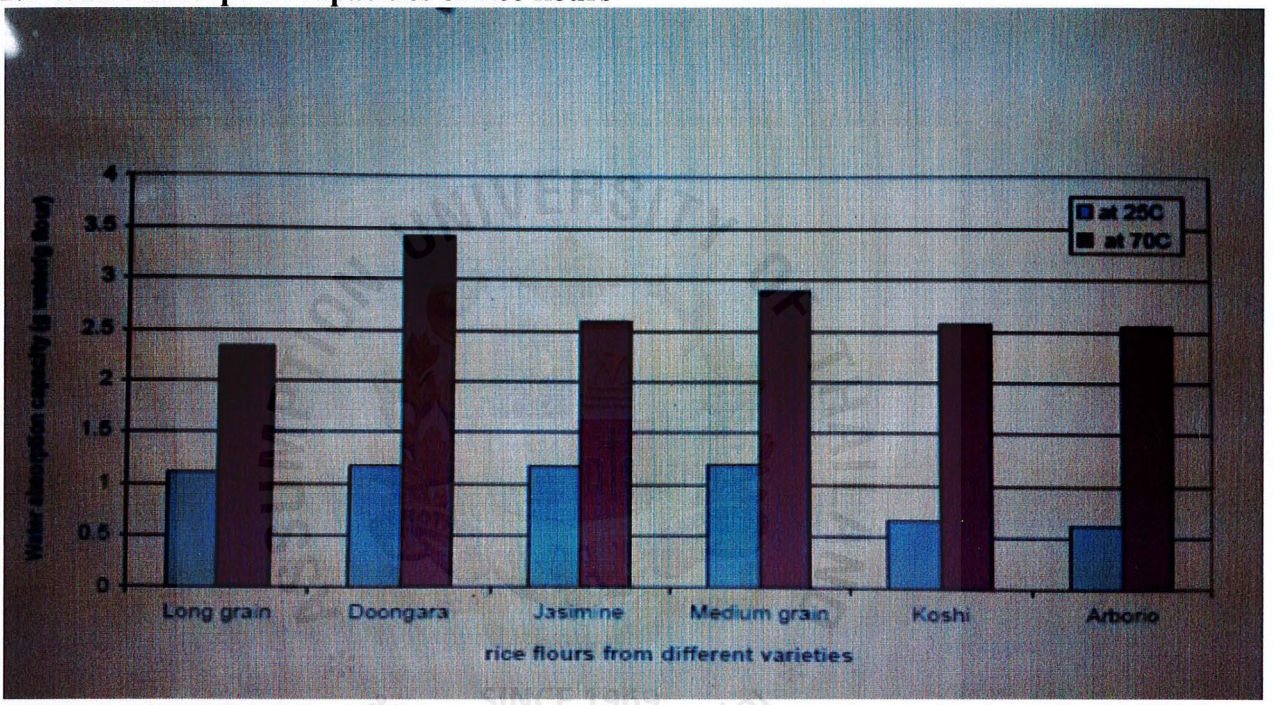
**Table 1 Sample list and description**

| Binder Name | Typical data |
|---|---|
| Rice Flour 580 | Long grain rice, 20-22% amylose content, 6.7% protein, 0.9% oil. Particle size: 5%> 500μm, 425μm <10-30% < 500μm, 212μm <40-60%< 425μm, 15-35%< 212μm. |
| Rice Flour 584 | Long grain rice, 20-22% amylose content, 6.7% protein, 0.9% oil. Particle size: 12%> 150μm, 88%< 150μm. |
| Rice Flour 587 | Long grain rice, 20-22% amylose content, 6.7% protein, 0.9% oil. Particle size: 0-2%> 1400μm, 1180μm <10-30%< 1400μm, 1000μm <20-40%<1180μm, 850μm <10-30%<1000μm, 500μm <15-35%< 850μm, 0-3%<150μm. |
| Rice Flour 578 | Medium grain rice, 18-20% amylose content, 6.4% protein, 0.7% oil. Particle size: 500μm <0-5%, 425μm<10-30%<500μm, 212μm <40-60%<425μm, 15-35%<212μm. |
| Rice Flour 594 | Medium grain rice, 18-20% amylose content, 6.4% protein, 0.7% oil. Particle size: 212μm <0-5%, 150μm <35-55%<212μm , 40-69%<150μm. |

**Table 2: The average particle size of rice flours**

| Rice flour | Average particle size (µm) |
|---|---|
| Flour 584 | 157.4 |
| Flour 594 | 177.9 |
| Flour 580 | 253.5 |
| Flour 578 | 253.5 |
| Flour 587 | 871.3 |
| Flour from lab miller | 208.0 |

**2.2 Water absorption capacities of rice flours**




(Williams, Pan& Poulson, 2010)

Figure 2: The comparison of rice flours from different resources on water absorption capacity at 25 and 70°C.

**3 Jasmine Rice Flour Productions**

To make the flour, the husk of rice or paddy is removed and raw rice is obtained, which is afterwards ground to flour.

**3.1 Flour Quality and the analysis methods**

Moisture, protein, ash, gluten, water absorption and other key parameters, such as RVA Analyses which can determine the Rapid Visco Analysis and chemical analysis for amylase content which was determine by applying starch-iodine blue and dyed grained method that could predict jasmine rice flour adulterations all of these can improve the consistency of end products and the entire milling process.

## 4. Application of Jasmine Rice Flour

### 4.1 Bread

The ingredient for making Jyoti Verma bread eaten for breakfast includes 1 cup of jasmine rice flour in the recipe. (Mannlein, 2009)

### 4.2 Cake

Thai-Style Jasmine Rice Cake with its ingredients include half cup uncooked jasmine rice and the top of the cake is served with grilled shrimp and sauce. (Miller, 2009)

### 4.3 Noodle

The dish in Jasmine Thai's pad Thai which is a mix of rice noodles with choice of meat, stir-fried eggs, crushed peanuts and bean sprouts. (Murchison, 2008)

### 4.4 production of germinated red jasmine brown flour

The process of soaking and germination of brown jasmine rice is used to as a nutritional ingredient in a healthy diet for diabetes patients as not only is it lower in carbohydrate and fat content but it also has a higher fiber content than native brown rice. (Wichamanee & Teerarat, 2012)

### 4.5 production of pasta from organic jasmine rice

The application of Pasta development from organic agriculture focuses on value added, creation of a new product for the market and protecting consumer's health. (Suteebut , Petcharat , Tungsathitporn , & Sae-tung , 2009)

### 4.6 Application of acceptance and purchase Intent ofnConsumers for Nonwheat Rice Butter Cakes

The study demonstrated feasibility of completely substituting wheat flour with Thai jasmine rice flour for production of butter cake products (products B and C) that are acceptable to American consumers. Development of the gluten-free butter cake products made from jasmine rice flour provides an alternative for utilization of broken jasmine rice as well as a potential alternative gluten-free product for consumers with

celiac sprue disease. The logistic regression analysis identified overall liking, taste, and, to lesser extent, odor as the critical attributes influencing overall acceptance and purchase intent of the butter cake products. These attributes should be focused for further product refinement and scale-up production for commercialization.

### 4.7 Application on Physical Properties of Butter Cake Made from Mixed Hom-Mali and Glutinous Rice Flours

This study demonstrated that glutinous rice flour could be used in a mix with Hom-Mali rice flour for substitution in the wheat flour in cake products and that show the pasting properties of mixed Hom-Mali rice and glutinous rice flours with varying amylose content were different. The physical properties of the butter cake samples were also different. In addition, the amylose content affected starch retrogradation and the texture properties of the butter cake with different ratios of mixed flour. Thus, the starch retrogradation contributed to the changes in texture properties (hardness increased and adhesiveness decreased).

### 4.8 New Applications for Rice Flour – Cake mix

The term Cake mix" in this application is generally a blend of rice flour and some other ingredient/s for use in some Japanese foods. The goal of Project "Cake mix" is to analyse current methods for determining key quality attributes. Coloured specks in the rice flour are of particular importance in some applications where the rice flour cake mix is kneaded and steamed and used for human consumption with little further processing. In these foods the coloured specks are readily visible against the cream / white background of the steamed rice flour dough and are considered by potential consumers to be very unattractive and undesirable.

Figure3: jasmine rice grain

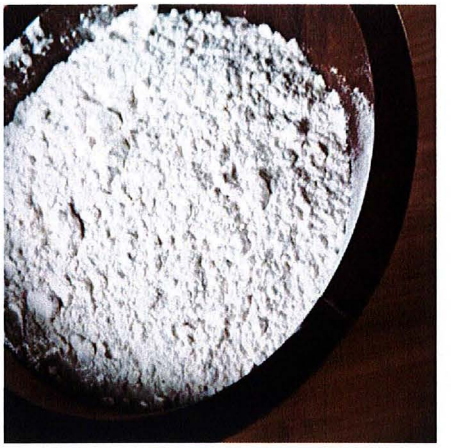


Figure3.1: jasmine rice flour

## Material and Methods and figures of making of samosa

**Raw materials**

All-purpose flour (Brand: KITE)

Vegetable oil (Brand: Thanakorn vegetable oil)

Frying pan

Jasmine rice flour

Banana stacks

Water

Butter

Brown sugar

Cans of sweet condensed milk

Ground sugar

**Equipment**

Clean cloths such tissue

Wooden spoons, knives

Frying pan

Big bowl

Roller

Thermometer

**Production of desert samosa with jasmine rice flour**

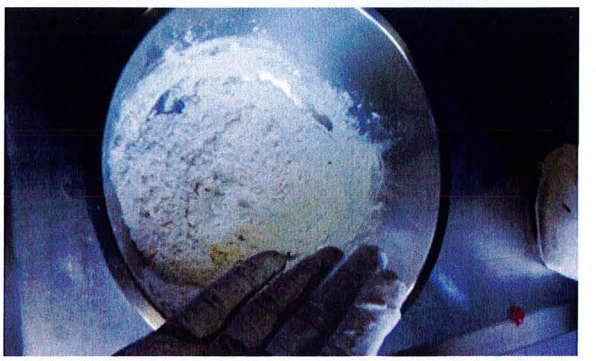
Put the all purpose flour with jasmine rice flour after sieving in a bowl with 3 g ground sugar, and cut in the butter. Mix in the water to form dough with hands.

Knead into a soft dough using water

Knead lightly and divide into 8 portions

And Form each into ball, and roll out a 7 inch round. Cut each one in half.

Spread each into a thin round sheet between the semi circles of pastry. Brush the edges of pastry all the way round with

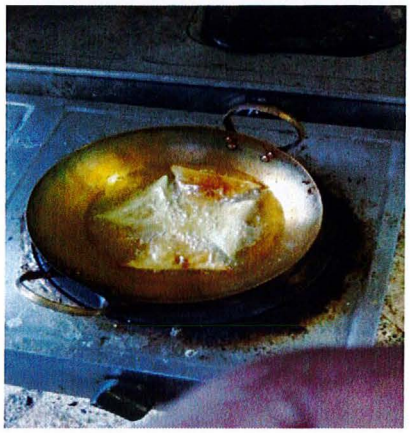


water, and ford over to form a cone shape, sealing the edges well together to enclose the filling.

**The filling part:**

Melt the 100g butter and100g brown sugar into a non-stick saucepan over a low heat, stirring all the time until the sugar has dissolved. Add the can of condensed milk and bring to a rapid boil for about a minute, stirring all the time for a thick golden caramel. Slice, cool and then chill for about 1 hour, until firm or until ready to serve. The bananas into small pieces and place them into a separate bowl.

Heat the vegetable oil in frying pan to 350F(180C)or just put some crumbs in the oil and see if they semi brown in 30 sec. Fry the samosa a few at a time until one side is brown turn the other side , put samosa to drain from excessive on the paper towel or tissue paper for serving.



**Preliminary test of different samosa formulas**

- formulation samosa wrap from all-purpose flour (APF) and jasmine rice flour
- Vary ratio for jasmine rice flour and APF from 0, 10, 20, 30, 40 and 50% substitution of jasmine rice flour in all-purpose flour
- Develop samosa stuff containing jasmine rice flour from (
- Kasetstart University)
- Prepare samosa filling containing banana and caramel.

**Formulation of samosa that contain rice wrap of jasmine rice flour**

1. **Screening Test**

The test was done to obtain the right amount of jasmine rice flour by picking amongst 0%, 10% 20%,30%,40%,50% of substitute jasmine rice flour with all purpose flour and testing for the stretch of the dough for producing samosa however we do not change the remaining ingredient and the result obtained was 3 level of dough substitute which are 0%,10%,20% while dough of 30%,40%,50% jasmine rice flour was incapable of stretch and fold for the wrap of the samosa. There we check the amount of water retention.

2. Amount of water used by different dough

| Percentage of jasmine rice flour | Amount of jasmine rice flour in the dough | Percentage of all purpose flour | Amount of purpose flour | Water used by the dough Out of 250ml |
|---|---|---|---|---|
| 0% | 0 | 100% | 200g | 160ml |
| 10% | 20g | 90% | 180g | 140ml |
| 20% | 40g | 80% | 160g | 120ml |
| 30% | 60g | 70% | 140g | 80ml |
| 40% | 80g | 60% | 120g | 50ml |
| 50% | 100g | 50% | 100g | 10ml |

We can notice from the table that the amount of water was lesser as we added more jasmine rice flour into the dough that it absorbs less water into its molecule to form the dough.

3. **Ratio of caramel and banana as well as thickness of the sheet**

Filling distribution for the caramel and banana was like 12g and 12g respectively making a total of 24 g as filling. Diameter of the circle is 6 to 7 cm and thickness is 0.28mm.

4. **Timing temperature**

Using a deep-frying thermometer to monitor the temperature of the oil, with a stable temperature, I obtained around 145–150 Celsius for each batch of 5 pieces for 1-2 mins

5. **Preference test using caramelized banana**

After finalizing the filling banana Carmella cooking as well as finishing the screening of the dough, the amount of jasmine rice flour was selectively altered into adjusting as 0%, 10%, and 20% respectively as they were the most suitable for samosa. The sample was analyzed with 9-point hedonic scale with also 30 panelists. And most people preferred 20% jasmine rice flour dough substitution.

6. **Consumer acceptance test**

Consumer acceptance test was carried away by using 100 people some of them around ABAC , Huamak campus and others from the street, I asked them to survey the questionnaires and score the product as they would generally approve.

7. **Chemical properties**

The final product of the preference test with 20% of jasmine rice flour was analyzed for moisture, ash, crude protein and fat contents.

8. **Statistical analysis**

RCBD- randomized complete block design with 4 replications and means comparison was analyzed by using Duncan's Multiple Range test.

# RESULTS AND/OR DISCUSIONS

## 1. Result of preliminary filling wrap preference and dough formulation

Jasmine rice flour was purchased for Kasetstart University as powder and kept in air tight container. After the several wrap it was determine that 0%,10%,20% of jasmine rice flour substitute were fitted for the construction of the samosa because it didn't collide and crumble like with 40% and 50% substituted ones.

**Table 1: Amount of water used by different dough**

| Percentage of jasmine rice flour | Amount of jasmine rice flour in the dough | Percentage of all purpose flour | Amount of purpose flour | Water used by the dough Out of 250ml |
|---|---|---|---|---|
| 0% | 0 | 100% | 200g | 160ml |
| 10% | 20g | 90% | 180g | 140ml |
| 20% | 40g | 80% | 160g | 120ml |
| 30% | 60g | 70% | 140g | 80ml |
| 40% | 80g | 60% | 120g | 50ml |
| 50% | 100g | 50% | 100g | 10ml |

## 2. Result from Ratio of caramel and banana

At the beginning the amount of caramel and banana were equals 12g for each of them making a total of 24g as filling.

## 3. Result for temperature and timing

Using a deep-frying thermometer to monitor the temperature of the oil, with a stable temperature, I obtained around 175–180 Celsius for batch 5 pieces for 1-2 minutes.

## 4. Result of Preliminary formulations of desert samosa containing jasmine rice flour

The preliminary formulation of desert samosa containing jasmine rice flour was performed by using commercially jasmine rice flour to replace all-purpose flour in the formula as 0%, 10%, and 20% and afterward, the samosas were sensory analyzed by using 9-hedonic scale and 30 panelists to determine the most favored. The result was shown in the table 3.

**Table 2: the average preference score of desert samosa with different level of jasmine rice flour.**

| Attribute | Responses | | | |
|---|---|---|---|---|
| Treatment | Appearance | Texture | Flavor | Overall |
| 0% | 4.1[a] | 4.7 [a] | 4.6[a] | 5.3 [a] |
| 10% | 4.6 [a] | 4.9 [a] | 4.9[a] | 4.5 [a] |
| 20% | 6.0 [a] | 7.6 [a] | 7.3[a] | 7.4 [a] |

*The same letters indicate that there is not significantly different at $p>0.05$.

### 4.1 Determination test of samosa containing 20% jasmine rice flour:

At first samosa with 20% jasmine rice flour were produced and subjected for just about right test (JAR) and with 30 panelists and asked for jasmine rice flour flavor attribute so that I can formulate the suitable formula of veggie samosa.

**Table 3: just about right test with 30 panelists of samosa containing 20 % of jasmine rice flour**

1) What can you say about the color of the samosa shell?

| 1 | 2 | 24 | 2 | 1 |
|---|---|---|---|---|
| Much too light | too light | Just about right | little too much | too dark |

2) What can you say about the crispness of the product?

| 1 | 3 | 23 | 2 | 1 |
|---|---|---|---|---|
| Much too light | too light | Just about right | little too much | too much |

3) What can you say about the sweetness of the product?

| 1 | 1 | 26 | 1 | 1 |
|---|---|---|---|---|
| Much too little | too little | Just about right | little too much | too much |

4) What can you say about the amount of banana for the filling?

| | | | | |
|---|---|---|---|---|
| | 1 | 27 | 1 | 1 |
| Much too little | too little | Just about right | little too much | too much |

5) What can you say about the saltiness of the product?

| | | | | |
|---|---|---|---|---|
| | | | | |
| Much too little | too little | Just about right | little too much | too much |

6) What can you say about the overall liking of the product?

| | | | | |
|---|---|---|---|---|
| 1 | 2 | 25 | 1 | 1 |
| Much too little | too little | Just about right | little too much | too much |

7) What can you say about the amount of caramel for the filling?

| | | | | |
|---|---|---|---|---|
| 4 | 3 | 22 | 1 | |
| Much too little | too little | Just about right | little too much | too much |

Banana and caramel were the two elements that can be detectable in the samosa. Most of the panelist have positive attitude about the product but some of them didn't like the texture when it gets cold and become hard to eat.

## 5. Proximity Analysis

**Table 3: chemical properties of samosa contain jasmine rice flour as 20%**

| Type | Moisture % | Ash % | Lipid % | Protein % |
|---|---|---|---|---|
| Samosa final product | 24.02% | 2.1% | 45.89% | 16.5% |

## 6. Consumer acceptance:

Finally, the desert samosa with 20% of jasmine rice flour were produced by using the ingredient: All purpose flour 160g, jasmine rice flour 40 g, water 120ml, ground sugar 3g.

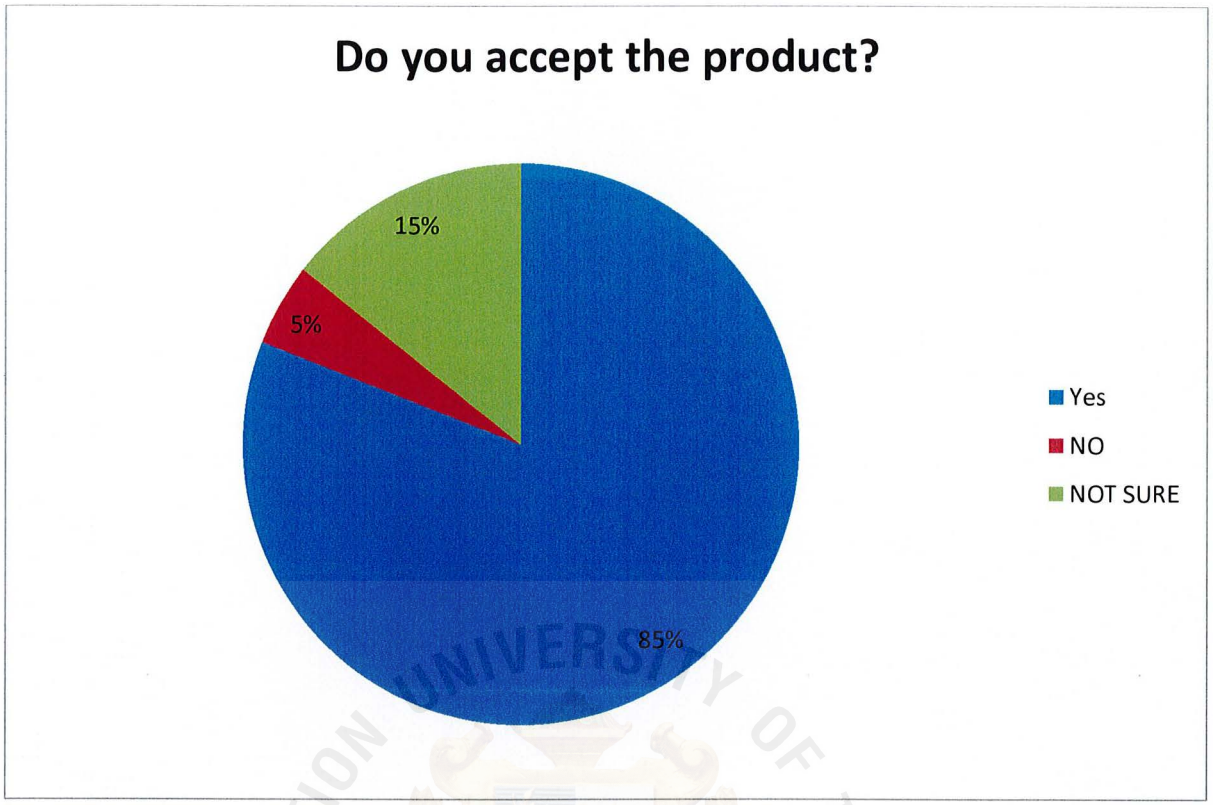
And for stuffing Melt the 100g butter and100g brown sugar into a non-stick saucepan over a low heat, stirring all the time until the sugar has dissolved. Add the can of condensed milk and bring to a rapid boil for about a minute, stirring all the time for a thick golden caramel.

Slice, cool and then chill for about 1 hour, until firm or until ready to serve. The bananas into small pieces and place them into a separate bowl.

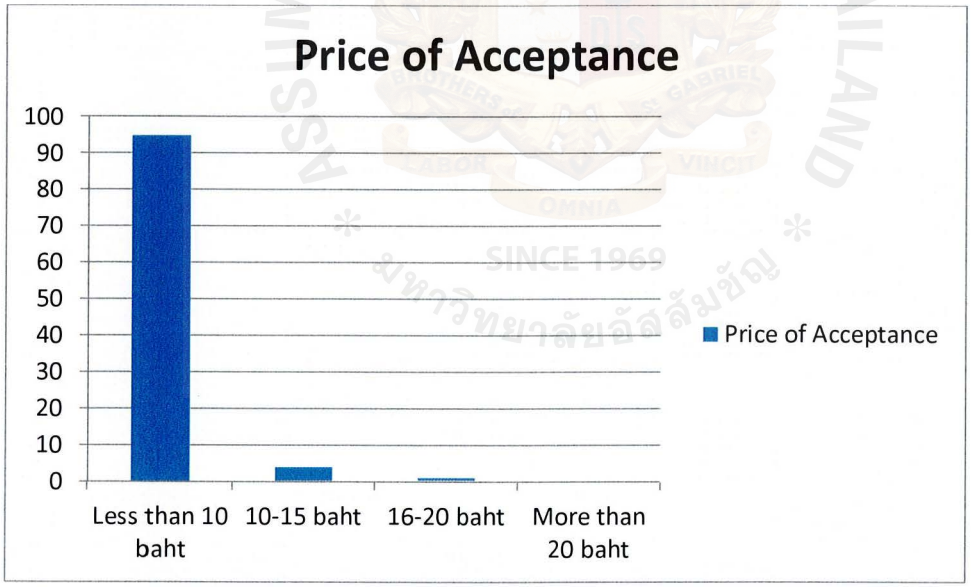
100 consumers acceptance was performed using general survey sheet analyzes some around the ABAC campus and others from Muslim areas like in area at the end of the street. People were voluntarily involved and given a set of questionnaires survey and asked for score the product based on their preference.

**Table 4: demographic information from consumer survey of 100 persons**

| Type | Categories | Percentage |
|---|---|---|
| Gender | male | 70 |
| | female | 30 |
| Age | Under 15 years | 3 |
| | 15-20 years old | 30 |
| | 21-30 years old | 57 |
| | 31-40 | 5 |
| | 41-50 | 4 |
| | Above 50 | 1 |
| Occupation | student | 80 |
| | employee | 15 |
| | Other business | 5 |




How much are you willing to pay for a single samosa weighed (27g)



For general questions of the samosa product, not many students have seen the product, so it might regard as new product in the thai market. But people like it because it sweet and chewy in texture for texture. But the texture is not as good as it is when it fresh than being stale.

For the table above, it illustrate more male participate in the survey than female gender. In addition, most people who involve in the survey were between 21-25years old, also age participant at15-20 years old come close to half with is 30%.

Finally, to the question of survey if the persons are willing to buying and accept the product only 85% replied yes and 13% with not sure and 2% with no answer.

# CONCLUSIONS

The new somasa product that is formed with 20% jasmine rice flour was mostly accepted by the survey consumers roughly 85% as well as with the preference score of 7.3 out of 9 hedonic scales, thus, there probably have a potential market for the new product. And jasmine rice flour has advantage health impact for human body as supplement.

# RECOMMENDATIONS

Although the camel and banana mixed might appeal to more consumers, the texture for some of the product were had to eat and get cold quicker , also some of them had more lipid so in order to improve the product in the future, we either serve them while it is warm or keep them in the airtight plastic bag.

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# APPENDIX (A)

# Chemical Analysis

## Appendix 1: Basic formula and Methods for chemical analysis and product

### Basic Formulas

To make the samosa filling: Melt the 100g butter and100g brown sugar into a non-stick saucepan over a low heat, stirring all the time until the sugar has dissolved. Add the can of condensed milk and bring to a rapid boil for about a minute, stirring all the time for a thick golden caramel. Slice, cool and then chill for about 1 hour, until firm or until ready to serve. The bananas into small pieces and place them into a separate bowl.

To make the dough: all ingredients were weighted. Jasmine rice flour was commercially bought from the Kasetstart University in a net weight of 200gms. Similarly, all purpose flour was also bought from local market as net weight of 200 kg in seal plastic bags. Mix flours, sugar ground in a bowl. Add water until the dough holds together, and knead well. Form the triangle shape then fill the cone two-thirds with filling mixture of caramel and banana. Moisten the lip of the cone with a little milk or water, and pinch to seal. Press the samosa between your palms to remove air pockets. Flute the top edge and cover with a moist cloth until ready to fry.

The product was then fried in prepared heated vegetable oil in a skillet for 25 to 30 seconds until light brown. After frying it was place under a cloth to absorb the excessive oil and placed into a tray to cool down. Later, each samosa was cut in small piece for further research analysis.

## Chemical Analysis

All food chemistry and analysis were done according to the lab manual FT3107 FOOD CHEMISTRY & ANALYSIS laboratory manual (staff, 2/2009).

## Determination of Moisture Content and Total Solids in Food

Procedure:

Aluminum moisture cans are cleaned and dried to constant weight in a hot air oven for 30 minutes, then cooled down in a desiccator before weighting and recording the dry weight. Before starting cans were weighted and recorded the dry weigh of the moisture. Next I weight the samples roughly 5g of sample in the known weigh can and record (using 4 decimals).after that Dry sample and can come next in the hot air oven at temperature 100-105 C for 3 hours. Then I removed from it from the oven and placed them into the desiccators to cool down. Finally, record the final weight of the cooled sample (Repeat drying until the weigh is constant)

The formulas used were 1) $Moisture\ content = \frac{Weight\ loss}{Weight\ of\ sample} \times 100$

2) Total solid (%) = 100 - % m.c

## Determination of Ash Content

Procedures

1. First the empty-cleaned crucible with its lid was incinerated in a muffle furnace at 550°C for 1 hour, then transferred to a desiccators and was leaved to cool down before weighing it.
2. Sample was weighted a suitable quantity (2-5 grams) of sample into the container and heat it gently with Bunsen burner until there is no smoke. Using tong to transfer sample to the muffle furnace and incinerate at 550°C until all the carbon has been burn away and light gray to white ash is obtained. Transfer the hot container to the desiccator, cool and weighting.
3. Calculate the total ash as a percentage of the original sample.

Formula used was **Ash content (%)** $= \frac{weight\ of\ Ash}{weight\ of\ sample} \times 100$

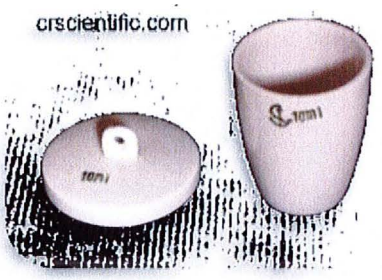



**Figure 5: porcelain crucible**

**Figure 6: desiccator**

## Determination o f Protein in Food using the Macro-Kjeldahl method

A catalyze mixture was prepared using 96% anhydrous sodium sulfate and 4 % copper sulfate, and selenium dioxide 0.5 % .as well as 4% boric acid solution. A 50% sodium hydroxide solution and mixed indicator comprising of methyl red 0.016% and bromocresol green 0.083% in ethyl alcohol and for the titration part 0.05 M standard sulfuric acid solution was used.

Weight the sample to 1 g and 4 digit decimal then put into the Kjeldahl flask containing 8g of catalyze mixture and 20 ml of conc. Acid. The flask was digested to slowly boiling at the same time swirling from time to time until a clear solution is obtained. The entire process was roughly completed around 3 hours.

Slowly pour 75 ml of 50 % NAOH to the distilling flask and insert the stopper immediately to prevent losing gas. Start distilling the solution, the ammonia gas is released and trapped by boric acid, at this moment, indicator starts to change color.

After digestion the flask was removed for the digester and cooled and diluted with water then made up to volume up to 400 ml and, mixed well.

The ammonium borate solution formed was titrated with standard 0.005 M sulfuric acid. Finally, calculate the nitrogen content and the protein content of the food sample.

**The conversion factors for converting percentage of nitrogen into protein used**

For purpose wheat flour = 5.70

- Conversion factors taken from FT3107 lab manual, page 16, table 4.1

Formulas used were **% Nitrogen content** $= \frac{0.28 \times (V_{sample} - V_{blank})}{Weight\ of\ sample}$

**% Crude protein** = % Nitrogen content × (100 / % Nitrogen in protein)

= % Nitrogen content × Conversion Factor (F)

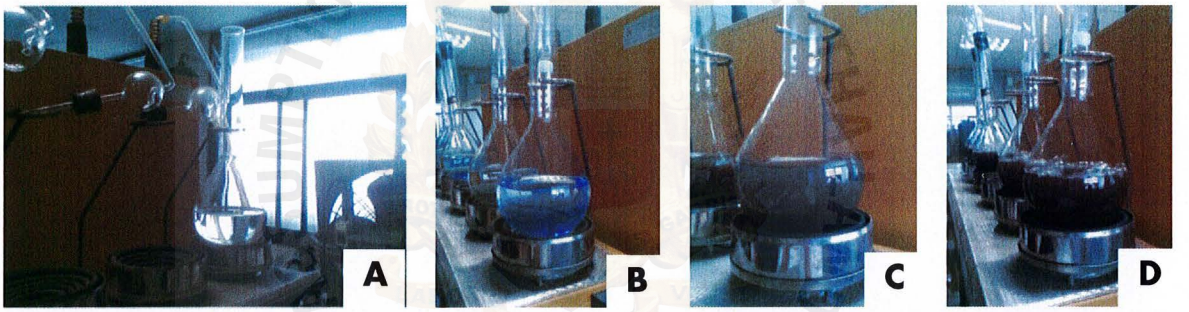



**Figure 7:** Distillation Process **A:** The flask after digestion,

**B:** The flask added with 75 mL 0f 50 % NaOH **C and D :** The flask during boiling

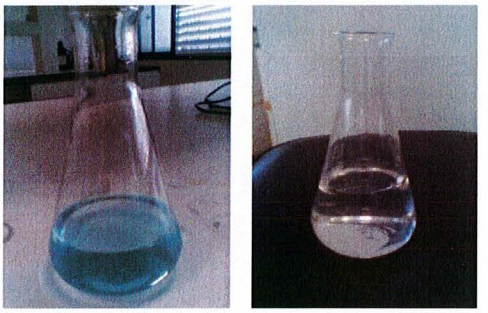


**Figure 8:** Volume of 0.05M $H_2SO_4$ use for sample 88 mL

**Left :** Ammonium borate solution before titration with $H_2SO_4$

**Right:** Ammonium borate solution after titration with $H_2SO_4$

**Figure 8.1:** Volume of 0.05M $H_2SO_4$ use for blank 0.2 mL

**Left :** Distilled water before titration with $H_2SO_4$

**Right:** Distilled water after titration with $H_2SO_4$

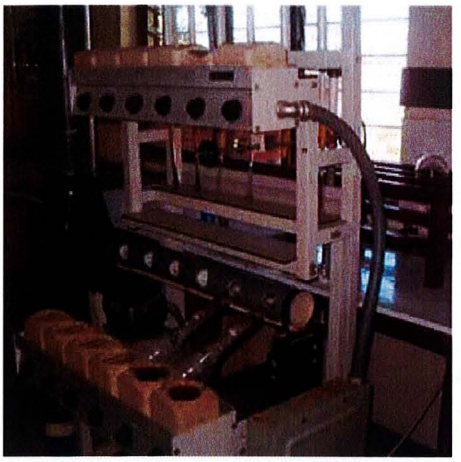


Figure 9: Kjelhdal digestion unit

## Determination of Fat Content by Soxhlet Extraction Method

1. Grind 10 – 15 g sample until the sample is all ground.
2. Weight the sample approximately 2g on a filter paper. Plug lightly with cotton ball on top of the sample to prevent spillage.
3. Pour 10 ml of petroleum ether into a pre-weighed-round-bottom flask and add 3-5 boiling chips to prevent bumping. Heat and monitor the heat process. Solvent should flush through the sample every 5 – 10 min.
4. After the extraction is finished, the round-bottom flask is removed and placed inside the hood to leave the solvent evaporate. All the solvent has been removed; the extracted fat was weighted and calculated for % fat content.

Formula used is $$\text{Crude Fat \%} = \frac{\text{weight of extracted fat}}{\text{Weight of sample}} \times 100$$

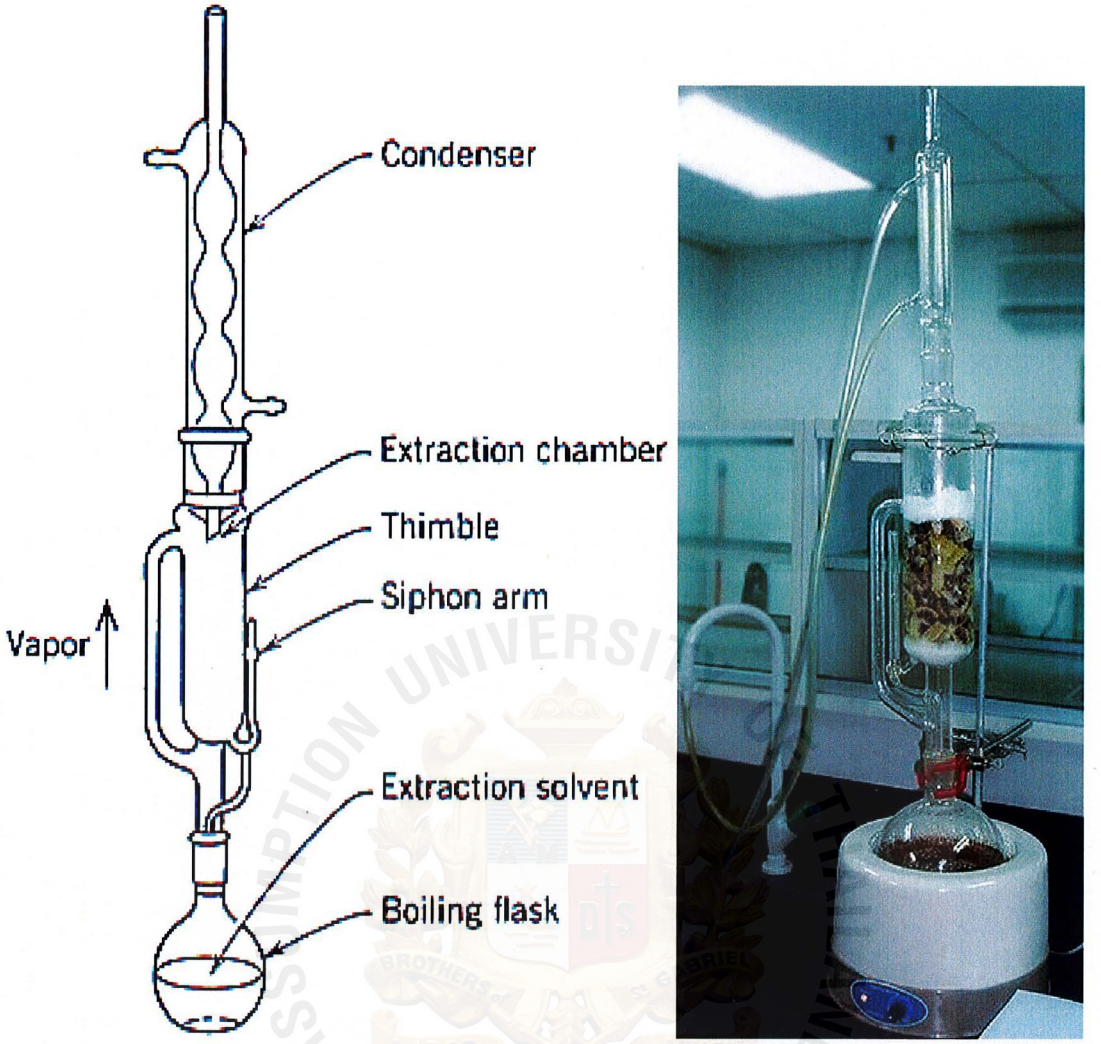



**Figure 10: Soxhlet Extraction Unit**

**Statistics Analysis**

The statistical data for the preliminary surveys liking Preliminary Surveys Likings Tests and Just About Tests were evaluate using SPSS program. The method used was randomized block design or RCBD. This method was chosen in order to determine whether there was any significant differences in scoring buy the panelists at a confidence level of 95 %.

# APPENDIX (B)

## Statistical Analysis

**SPSS Results for Liking Test**

## Univariate Analysis of Variance

Appearance

**Between-Subjects Factors**

| | | Value Label | N |
|---|---|---|---|
| trt | .00 | .00 | 30 |
| | 10.00 | 10.00 | 30 |
| | 20.00 | 20.00 | 30 |

**Tests of Between-Subjects Effects**

Dependent Variable:Appearance

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 62.489[a] | 2 | 31.244 | 26.348 | .000 |
| Intercept | 2141.344 | 1 | 2141.344 | 1805.786 | .000 |
| trt | 62.489 | 2 | 31.244 | 26.348 | .000 |
| Error | 103.167 | 87 | 1.186 | | |
| Total | 2307.000 | 90 | | | |
| Corrected Total | 165.656 | 89 | | | |

a. R Squared = .377 (Adjusted R Squared = .363)

## Post Hoc Tests
## Trt
## Homogeneous Subsets

**Appearance**

| | trt | N | Subset 1 | Subset 2 |
|---|---|---|---|---|
| Duncan[a,b] | .00 | 30 | 4.1000 | |
| | 10.00 | 30 | 4.5000 | |
| | 20.00 | 30 | | 6.0333 |
| | Sig. | | .158 | 1.000 |

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 1.186.

a. Uses Harmonic Mean Sample Size = 30.000.

b. Alpha = .05.

**Texture**

**Between-Subjects Factors**

| | | Value Label | N |
|---|---|---|---|
| trt | .00 | .00 | 30 |
| | 10.00 | 10.00 | 30 |
| | 20.00 | 20.00 | 30 |

**Tests of Between-Subjects Effects**

Dependent Variable:Texture

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 161.156[a] | 2 | 80.578 | 159.445 | .000 |
| Intercept | 2969.878 | 1 | 2969.878 | 5876.710 | .000 |
| trt | 161.156 | 2 | 80.578 | 159.445 | .000 |
| Error | 43.967 | 87 | .505 | | |
| Total | 3175.000 | 90 | | | |
| Corrected Total | 205.122 | 89 | | | |

a. R Squared = .786 (Adjusted R Squared = .781)

## Post Hoc Tests
## trt
## Homogeneous Subsets

**Texture**

| | trt | N | Subset 1 | Subset 2 |
|---|---|---|---|---|
| Duncan[a,b] | 10.00 | 30 | 4.7000 | |
| | .00 | 30 | 4.9000 | |
| | 20.00 | 30 | | 7.6333 |
| | Sig. | | .279 | 1.000 |

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = .505.

a. Uses Harmonic Mean Sample Size = 30.000.

b. Alpha = .05.

**Flavor**

**Between-Subjects Factors**

| | | Value Label | N |
|---|---|---|---|
| trt | .00 | .00 | 30 |

| | | | |
|---|---|---|---|
| | 10.00 | 10.00 | 30 |
| | 20.00 | 20.00 | 30 |

**Tests of Between-Subjects Effects**

Dependent Variable:Flavor

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 134.822[a] | 2 | 67.411 | 111.568 | .000 |
| Intercept | 2833.611 | 1 | 2833.611 | 4689.743 | .000 |
| trt | 134.822 | 2 | 67.411 | 111.568 | .000 |
| Error | 52.567 | 87 | .604 | | |
| Total | 3021.000 | 90 | | | |
| Corrected Total | 187.389 | 89 | | | |

a. R Squared = .719 (Adjusted R Squared = .713)

## Post Hoc Tests
## trt
## Homogeneous Subsets

**Flavor**

| | trt | N | Subset 1 | Subset 2 |
|---|---|---|---|---|
| Duncan[a,b] | 10.00 | 30 | 4.6000 | |
| | .00 | 30 | 4.9000 | |
| | 20.00 | 30 | | 7.3333 |
| | Sig. | | .139 | 1.000 |

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = .604.

a. Uses Harmonic Mean Sample Size = 30.000.

b. Alpha = .05.

**Overall**

**Between-Subjects Factors**

| | | Value Label | N |
|---|---|---|---|
| trt | .00 | .00 | 30 |
| | 10.00 | 10.00 | 30 |
| | 20.00 | 20.00 | 30 |

**Tests of Between-Subjects Effects**

Dependent Variable:Overall

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 137.956[a] | 2 | 68.978 | 180.937 | .000 |
| Intercept | 2969.878 | 1 | 2969.878 | 7790.333 | .000 |
| trt | 137.956 | 2 | 68.978 | 180.937 | .000 |
| Error | 33.167 | 87 | .381 | | |
| Total | 3141.000 | 90 | | | |
| Corrected Total | 171.122 | 89 | | | |

a. R Squared = .806 (Adjusted R Squared = .802)

## Post Hoc Tests
## trt
## Homogeneous Subsets

**Overall**

| | trt | N | Subset 1 | Subset 2 | Subset 3 |
|---|---|---|---|---|---|
| Duncan[a,b] | 10.00 | 30 | 4.5000 | | |
| | .00 | 30 | | 5.3000 | |
| | 20.00 | 30 | | | 7.4333 |
| | Sig. | | 1.000 | 1.000 | 1.000 |

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = .381.

a. Uses Harmonic Mean Sample Size = 30.000.

b. Alpha = .05.

# APPENDIX (C)

# Calculations for Chemical Analysis

Calculations of chemical analysis

**Table 5: Determination of Moisture contents in final product**

| **Description** | Can#1-trial 1 | Can#2-trial 2 | Can#3 |
|---|---|---|---|
| Weight of moisture can with lid (grams) | 16.7230 | 16.3360 | 16.2477 |
| Weight of sample before drying (grams) | 4.6977 | 4.9183 | 4.8912 |
| Weight of sample + moisture can after drying (grams) | 20.2413 | 20.1154 | 19.9795 |
| Weight of sample after drying (grams) | 3.5183 | 3.7794 | 3.7318 |
| Weight loss (grams) | 1.1794 | 1.1449 | 1.1594 |
| % moisture content (% m.c.) | 25.1059 | 23.2783 | 23.7037 |
| % total solid | 74.894 | 76.7216 | 76.2962 |

(Weight of sample after drying (grams) = )Weight of sample + moisture can after drying) – (Weight of moisture can with lid)

= 20.2413 – 16.7230

= 3.1518 g

Weight loss = weight of sample before drying – weight of sample after drying

= 4.6977 – 3.5183

= 1.1794 g

- % moisture content (% m.c.) = (Weight loss/ Weight of sample) * 100

= (1.1794 / 4.6977) * 100

= 25.1059%

- % total solid = 100 - % m.c.

= 100 – 25.1059

= 74.894%

**Can#2**

- Weight of sample after drying (grams) = )Weight of sample + moisture can after drying) – (Weight of moisture can with lid)

= 20.1154 – 16.3360

= 3.7794 g

- Weight loss = weight of sample before drying – weight of sample after drying

= 4.9183 – 3.7794

= 1.1449 g

- % moisture content (% m.c ) = (Weight loss/ Weight of sample) * 100

= (1.1449 / 4.9183) * 100

= 23.2783%

- % total solid = 100 - % m.c.

= 100 – 23.2783

= 76.7216%

**Can#3**

- Weight of sample after drying (grams) = )Weight of sample + moisture can after drying) – (Weight of moisture can with lid)

= 19.9795 – 16.2477

= 3.7318 g

- Weight loss = weight of sample before drying – weight of sample after drying

= 4.8912 – 3.7318

= 1.1594 g

- % moisture content (% m.c.) = (Weight loss/ Weight of sample) * 100

= (1.1594 / 4.8912) * 100

= 23.7037%

- % total solid = 100 - % m.c.

= 100 – 23.7037

= 76.2962%

**Average**

The average weight loss = weight loss of (can#1 + can#2 + can#3) / 3

= (1.1794 + 1.1449 + 1.1594) / 3

= 1.1612 g

The average %moisture content = %moisture content of (can#1 + can#2 + can#3) / 3

= (25.1059 + 23.2783 + 23.7037) / 3

= 24.0293%

The average %total solid = %total solid of (can#1 + can#2 + can#3) / 3

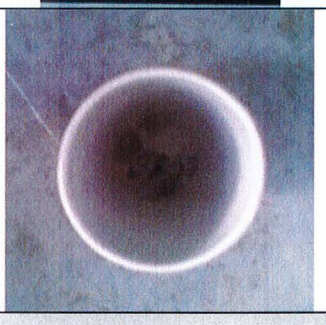
= (74.894 + 76.7216 + 76.2962) / 3

= 75.9706%

**Table 6: Determination of ash content**

The crucible was weigh before adding the sample, then the balance was tare to weigh the adding the sample. After that the crucible was heated in the furnace for overnight and weight

to determine the weight of the ash. Then all the data will be used to calculate for the % ash content of the sample. The data table is shown below:

| Description | Sample | Appearance |
|---|---|---|
| Weight of crucible with lid )gram ( | 48.3527 |  |
| Weight of sample before drying )gram ( | 1.0460 |  |
| Weight of sample + crucible after drying ) gram ( | 48.3749 g |  |
| Weight of ash )gram ( | 0.0222 g | |
| % ash content | 2.1224 % | |

**Weight of ash** = (Weight of sample + crucible after drying( – )Weight of crucible with lid(

= 48.3749 – 48.3527

= 0.0222 g

**Ash content (%)** = $\frac{weight\ of\ Ash}{weight\ of\ sample} \times 100$

= $\frac{0.0222}{1.0460} \times 100$

= 2.1224 %

**Determination of crude protein content**

Macro-Kjeldahl Method

Sample: fruit samosa

**Preparation the reagents that used in the experiment→**

1. **Preparation of 0.05M Standard sulfuric acid solution ($H_2SO_4$):**

Sulfuric acid solution 1 M has $H_2SO_4$ 98.08 g

Sulfuric acid solution 0.05 M has $H_2SO_4$ $\frac{98.08 \times 0.05}{1}$ = 4.904 g

4.904 g is used for sulfuric acid solution in 1000 ml but we want to prepared 0.05 M of sulfuric acid solution 250 ml :

Sulfuric acid solution 1000 ml we have to used $H_2SO_4$ = 4.904 g

Sulfuric acid solution 250 ml we have to used $H_2SO_4$ = $\frac{4.904 \times 250}{1000}$ = 1.266 g

Specific gravity of concentration $H_2SO_4$ = 1.80 g

So concentration $H_2SO_4$ 1.80 g ⟶ 1 ml

Concentration $H_2SO_4$ 1.266 g ⟶ $\frac{1.266 \times 1}{1.80}$ = 0.67 ml □ 0.7 ml

As a result, we prepared 0.7 ml of concentration $H_2SO_4$ and added water until it reached to 250 ml.

2. **Calculation for standard sulfuric acid solution by titration with known concentration of NaOH:**

Concentration of NaOH = 0.091 M

**Table2: Show the volume of $H_2SO_4$ and NaOH that we used for calculation concentration of standard sulfuric acid solution→**

| Description | Trail 1 | Trail 2 |
|---|---|---|
| **Volume of $H_2SO_4$ used (ml)** | 10 | 10 |
| **Volume of NaOH used (ml)** | 9.7 | 9.8 |

Average volume of NaOH used = (9.7 + 9.8)/2 = 9.75 ml

$M_{NaOH}\ V_{NaOH} = M_{H2SO4}\ V_{H2SO4}$

Whereas; M = Molarity

V = volume used

$(0.091)(9.75) = M_{H2SO4}\ (10)$

$M_{H2SO4} = 0.0887$ M

But 1 mol of $H_2SO_4$ react with 2 mol of NaOH

So $M_{H2SO4}$= 0.0887/2= 0.0443 M

3. **400 ml of 4% ( w/v) Boric acid solution:**

100 ml of Boric acid solution contains 4 g of Boric acid (s)

400 ml of Boric acid solution contains (4x400) / 100 = 16 g

As a result, we prepared 16 g of Boric acid(s) and added water until it reached to 400 ml.

**4. 50% (w/v) Sodium Hydroxide solution:**

100 ml of NaOH solution contains 50 g Of NaOH (s)

600 ml of NaOH solution contains (50 x 600) /100 = 300 g

As a result, we prepared 300 g of Sodium Hydroxide (s) and added water until it reached to 600 ml.

**5. Mixed indicator : Methyl red 0.016% and bromocresol green 0.083% in Ethyl alcohol:**

We prepared 0.016 g of methyl red and 0.083 g of ethyl alcohol and diluted all in 100 ml of ethanol.

**6. Catalyst mixture:**

We mixed 96 g of anhydrous sodium sulfate with 4 g of copper sulfate.

❖ **Calculation %nitrogen content and %crude protein→**

**Table3: Show the volume of sample, 0.05M $H_2SO_4$ used for sample and 0.05M $H_2SO_4$ used for blank that we used for calculation %nitrogen content and %crude protein in sample→**

| Description | Sample |
|---|---|
| **Volume of sample (ml)** | 5 |
| **Volume of 0.05M $H_2SO_4$ used for sample (ml)** | 52 |
| **Volume of 0.05M $H_2SO_4$ used for blank (ml)** | 0 |

% nitrogen content = 0.28 x ($V_{sample} - V_{blank}$)

Volume of sample = $0.28 \times \frac{(52 - 0)}{5}$ = **2.912 %**

Therefore, the % total nitrogen of fish sauce is 2.912 %

% crude protein = % total nitrogen x Conversion factor (f)

= 2.912 x 5.7

= **16.5 %**

Therefore, the % crude protein of fish sauce is 16.5 %

Remarks: The sample was samosa which is made of whole wheat, the conversion factor is 5.7

**Determination of fat content**

Sample1: samosa sample

| Description | Weight (g) |
|---|---|
| Weight of round bottom flask | 95.5124 |
| Weight of sample | 10 |

| | |
|---|---|
| Weight of extracted fats + flask | 100.101 |
| Weight of extracted fats | 4.5886 |
| % crude fats | 45.89% |

Weight of extracted fats = weight of extracted fats and flask – weight of round bottom flask

= 100.101 – 95.5124 = 4.5886g

$$\text{Crude fats (\%)} = \frac{\text{weight of extracted fats} \times 100}{\text{Weight of sample}}$$

$$\text{Crude fats (\%)} = \frac{4.5886 \times 100}{10}$$

Crude fats (%) = **45.89%**

# APPENDIX (D)

## Survey Questionnaires

1. **Liking Preference Test**

Product: banana caramel samosa with 0%, 10%, and 20% jasmine rice flour

If you don't mind take the sample and evaluate each attribute which are (texture- color- flavor-appearance)

Mark the production according to the scores below

Tick and X in the box to describe if an attribute is too much or too less

| Sample number | 445 (0%) | 326 (10%) | 423(20%) |
|---|---|---|---|
| Appearance | | | |
| color | | | |
| texture | | | |
| flavor | | | |

2. **Liking test and just about right test**

DEAR CONSUMER,

I hope that you can find the few minutes required to complete this questionnaire and help to improve the product. Thank you for your co-operation.

Product: banana caramel samosa with 20% rice flour.

**Instruction**

***First: Overall liking test***

The 9-point hedonic scale of preference test

9= Like Extremely

8= Like Very Much

7=Like Moderately

6=Like Slightly

5=Neither Like or Dislike

4=Dislike Slightly

3=Dislike Moderately

2=Dislike Very Much

1=Dislike Extremely

The preference test of the 9-point hedonic scale of each sample as following accordingly:

| **Attributes** | **Sample** |
|---|---|
| **Appearance** | ____ |
| **Texture** | ____ |
| **Flavor** | ____ |
| **Overall** | ____ |
| **Comment**: | ____ |

***Second: just about right test***

Put a marking (X) the box which suits very much according to your opinion.

8) What can you say about the color of the samosa shell?

| | | | | |
|---|---|---|---|---|
| | | | | |
| Much too light too dark | too light | Just about right | little to much | |

9) What can you say about the crispness of the product?

| | | | | |
|---|---|---|---|---|
| | | | | |
| Much too light too much | too light | Just about right | little too much | |

10) What can you say about the sweetness of the product?

| | | | | |
|---|---|---|---|---|
| | | | | |
| Much too little much | too little | Just about right | little too much | too |

11) What can you say about the amount of banana and caramel for the filling?

| | | | | |
|---|---|---|---|---|
| | | | | |
| Much too little too much | too little | Just about right | little too much | |

12) What can you say about the saltiness of the product?

| | | | | |
|---|---|---|---|---|
| | | | | |
| Much too little too much | too little | Just about right | little too much | |

13) What can you say about the overall liking of the product?

| | | | | |
|---|---|---|---|---|
| | | | | |
| Much too little too much | too little | Just about right | little too much | |

14) What can you say about the amount of caramel for the filling?

| | | | | |
|---|---|---|---|---|
| Much too little too much | too little | Just about right | little too much | |

**Questionnaire for final consumer survey**

This survey is a part of special project course (FT 4190) for Bachelor's degree of Faculty of Biotechnology, Assumption University. The survey would aim to study about the consumer's behavior, acceptance and opinion towards the new development of fruit samosa for vegetarians. Please check (√ or X) in the providing box to answer the questions

**Part 1: Consumer behavior on the on bakery product in general.**

1. How often do you do you eat bakery product?

☐ Everyday ☐ 2-3 times a week ☐ Once a week

☐ Twice a month ☐ Once a month or less

2. Do you usually prefer them sweet or savory product?

☐ Sweet ☐ Savory

3. What is your favorite bakery product?

☐ Danish (Pastry) ☐ Cake (piece or whole) ☐ Pie

☐ Donuts ☐ Bread ☐ Waffle

☐ Others, please specify.....

4. How likely would you try a bakery product which is brand new to market?

☐ Yes why not? ☐ If that is delicious ☐ Not really

5. Do you know about samosa?

☐ Yes ☐ No If not, please skip to part 2

6. In general, what type of samosa do you prefer to consume? (Select 3 kinds)

☐ Chicken samosa ☐ Minced samosa

☐ Pea potatoes samosa ☐ Soy meat texture samosa

☐ Fruit tar samosa ☐ Curry tomatoes samosa

☐ Others, please specify.....

7. How often do you consume samosa?

☐ Every day ☐ 4-5 times per week

☐ 2-3 times per week ☐ Once a week

☐ 2-3 times per month ☐ Once a month

☐ Less than once a month

8. Where do you usually buy samosa?

☐ Convenient stores ☐ Supermarkets ☐ Coffee shops

☐ Local stores ☐ Others

**Part 2. Hedonic scale and acceptance of fruit samosa of Consumer behavior on Veggie samosa for vegetarian.**

1. How would you rate this veggie fruit samosa? Follow the following guidelines and put the number in the space.

| | | |
|---|---|---|
| Like extremely =9 | Like very much =8 | Like moderately =7 |
| Like slightly =6 | Neither like nor dislike =5 | Dislike slightly =4 |
| Dislike moderately=3 | Dislike very much =2 | Dislike extremely=1 |

| Overall | Appearance | Taste | Flavor | Texture |
|---|---|---|---|---|
| | | | | |

2. Do you accept this product?

☐ Yes ☐ No

3. Will you buy the product if it contains a reasonable price in the market?

☐ Yes ☐ No because .....

4. How much are you willing to pay for a single samosa weighed (27 g)?

☐ Less than10 Baht ☐ 10-15 Baht ☐ 16-20 Baht
☐ more than 20 Baht

**Part 3: Consumer demographic information**

1. Gender

☐ Male ☐ Female

2. Age

☐ Under 15 years old ☐ 15-20 years old
☐ 21-30 years old ☐ 31-40 years old
☐ 41-50 years old ☐ 51-60 years old
☐ More than 60 years old

3. Occupation

☐ Student ☐ Businessman/Businesswoman
☐ Scientist ☐ Housewife
☐ Engineer ☐ Professor/ Teacher

Others

4. Nationality

☐ Thai ☐ Non-Thai (Please specify)

.....Thank You .....