Determination of Nutritional Values in Three Brands of Pastry

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Abstract- Pastry is generally made by mixing flour and sugar together, which are excellent sources of carbohydrates and a sufficient amount of energy. Milk and eggs that containing in pastry products which are known to be some of the major sources of protein and minerals. In this research, three brands of pastry sample I, sample II and sample III locally known as *Nan-Khatai* were selected for nutritional analysis. These samples were purchased from local market in Mandalay, Mandalay Region. Nutritional compositions such as pH, moisture, ash content, fat, protein, reducing sugar, carbohydrate and elemental composition of these samples were determined by some sophisticated methods. The pH values were detected by using pH meter. The ash and moisture contents were determined by dry-ashing and oven drying methods. The fat contents were determined by Soxhlet extraction method and protein contents were analyzed by using Kjeldahl's analyzer. The reducing sugar contents of samples were examined by using iodometric titration method and carbohydrate contents were analyzed by phenol-sulphuric acid method. Quantitative determination of mineral contents in sample I, II and III were carried out by applying Energy Dispersive X-ray Fluorescence (EDXRF) spectrophotometer. The overall experimental data indicated that the selected three brands of pastry samples in Myanmar contain suitable nutritional compositions.

Index Terms- pastry, nutritional values, Kjeldahl's analyzer, EDXRF, phenol-sulphuric acid method

I. Introduction

The nutritional value of food refers to its capacity to nourish the body with the substance needed to live and grow. The body relies on food for fuel and to obtain the chemical compounds it needs to function. The seven major types of nutrients are carbohydrates, fats, proteins, water, fiber, vitamins and minerals. The first five nutrients are considered macronutrients, which are the nutrients the body requires in relatively large quantities. The last two nutrients vitamins and minerals are considered micronutrients, which the body only needs in relatively small amounts. The body primarily uses carbohydrates and fats as fuel to supply the body with the energy, or calories, it needs for activity. Proteins are important because they are the body's only source of essential amino acids. Amino acids are the "building blocks of life" [6].

Pastry is generally made by mixing flour and sugar together, which are excellent sources of carbohydrates. They can provide the entire body, including muscles, brain and nervous system, with a sufficient amount of energy. Milk and eggs that containing in pastry products which are known to be some of the major sources of protein and minerals.

Eating pastry can provide with numerous health benefits and help body stay fit. However, long term consumption of sugar based products result in obesity and the consequent problems since these are made with a high level of energy and calories [7].

Normally, 85% of daily energy use is from fat and carbohydrates and 15% from protein. In humans, nutrition is mainly achieved through the process of putting foods into our mouths, chewing and swallowing it. All kinds of foods contain different components and proportions. People eat different kinds of food to satisfy the body's needs for various nutrients.

In the present work, customer favorable brands of pastry were selected and labeled as sample I, sample II and sample III for investigation of nutritional contents in these samples.

II. Materials and Methods

Sampling

Three brands of pastry (samples I, II and III) locally known *Nan Khatai* were purchased from local market in Mandalay. They were chopped into small pieces to be grounded to powder and then store in air-tight well stopped bottles for further use.

sample I sample II sample III

Figure (1) Pastry of sample I, II and III

Determination of pH

The pH values of samples were measured by using pH meter [1].

Moisture Content

5 g of sample was accurately weighed and then dried in an oven for about 2 hr at 101°C. It was then removed from the oven and cooled in a desiccators at room temperature and weight. The procedure was repeated until the constant weight was obtained [3].

Ash Content

The sample 5 g was weight and placed in a preheated cooled and weighed the crucible. The crucible was heated carefully in the furnace at 525°C for 4 hours burned off without flaming or until all the carbon was eliminated. When the materials are converted to white ash powder, the crucible was cooled at room temperature in a desiccators and weighed again. To obtain a constant weight, the heating, cooling and weighing were repeated [1].

Fat Content

Fat contents were determined by using the Soxhlet extraction method.

50 g of sample accurately weighed was introduced into a thimble and a piece of cotton wool was placed the open end of the thimble. The thimble containing sample was then placed in a soxhlet apparatus. Then the apparatus was fixed with 500 mL round-bottomed flask containing 350 mL petroleum ether (b.p 40-60 C). The extraction flask was heated on the water bath for 8 hours at the boiling point of petroleum ether. After the extraction was completed, most of the ether extract was distilled off. The content in the flask were carefully transferred to a weight specimen tube. The remaining ether in the specimen tube was vapourized until constant weight was obtained [2].

Protein Content

1 g of sample was weighted and placed in the Kjeldahl's digesting flask. 5 g of K_2SO_4+(0.5g)$CuSO_4.5H_2O$ and 10 mL of 98% sulphuric acid and 10 mL of distilled water were added into it in such a way as to wash solid adhering to the neck. The flask was shaken until the contents were thoroughly mixed and it was heated till the mixture became colorless.

The digestion was continued for half an hour to make sure that all nitrogen in the sample was converted to ammonium sulphate. Then it was allowed to cool.

The Kjeldahl's distillation apparatus was setup, taking care that the tip of the condenser extended below the surface of the 4% boric acid solution 50 mL in the receiver. The digested solution was poured into the flask together with 50 mL of 40% sodium hydroxide to make mixture strongly alkaline. The sample is distilled until 100 mL of distillate are collected in 50 mL of 4% boric acid. The evolved ammonia was distilled off.

Add 2-3 drops methyl red indicator to the conical flask containing boric acid and titrate it with 0.1MHCL until a faint pink color is obtained. A blank determination was carried out without sample using the reagents as in the case of sample. The nitrogen content of sample can be calculated by using following formula [1].

$$\text{Nitrogen (\%)} = \frac{(V_S - V_B) \times M \times 14.01}{W \times 10}$$

Where,

V_S = the volume of acid used in the test
V_B = the volume of acid used in the blank
M = the concentration of acid used
14.01 = atomic weight of N
W = the weight of sample,
10 = Factor to convert mg/g to %
F = Factor to convert N to protein

Protein (%) = Nitrogen × 6.25

Where,

6.25 = a factor of protein – Nitrogen conversion

Carbohydratte Contents

The water soluble carbohydrate was determined by phenol-sulphuric acid colorimetric method in terms of glucose.

0.1 g of sample powder was dissolved in 100 mL of hot water and shaken for ten minutes. 1 mL of this solution was then diluted to 10 mL with water and this solution was taken as the sample extract.

100 mg (0.1g) of hydrated glucose was exactly weighted and dissolved in 100 mL of distilled water. 1,2,4,6,8 and 10 mL of these solutions were drawn out and put in each 100 mL volumetric flask and dilute to the mark with distilled water. These solutions contained 10, 20, 40, 60, 80 and 100 µg of glucose per ml respectively.

1 mL of sample solution and six standard sugar solutions containing 10, 20, 40, 60, 80 and 100 µg of glucose per mL were put in each test tube. 1mL of 2% phenol solution was also added to each test tube and mixed. A blank also prepared with 1 mL of distilled water instead of sugar solution. 5 mL of 96% sulphuric acid was again added to each tube so that the stream hit the liquid surface directly to produce good mixing. Each test tube was agitated during the addition of acid.

After ten minutes, the tube was shaken and placed in water bath at 25- 30°C for twenty minutes. The yellow orange color was stable for several hours. Absorbance was measured at 490 nm using UV- visible spectrophotometer.

A standard curve was plotted by the absorbance of the standard solution against the concentration in µg per mL. Using this standard curve, the concentration of glucose in the sample was calculated [4].

Sugar Contents in Pastry

Determination of Concentration of Iodine Solution

10 mL of glucose solution was taken in conical flask and 20 mL of 0.05 M iodine solution and 45 mL of 0.1 M sodium hydroxide solution were added into the flask. The flask was closed and left in the dark place for 15 minutes. Then, 6 mL of 1 M hydrochloric acid was added and titrated with 0.05 M sodium thiosulphate solution. When the liquid became straw color, 1 mL of starch solution was added. The liquid became dark blue color again and titrated until the colorless content was obtained. From the experimental data, the concentration of iodine solution can be calculated.

Red color | Straw color | Dark blue color | Colorles

Figure (2) Determination of Iodine Concentration

Determination of Sugar Content in Samples

10 mL of sample solution was taken in conical flask and 20 mL of 0.05 M iodine solution and 45 mL of 0.1 M sodium hydroxide solution were added into the flask. The flask was closed and left in the dark place for 15 minutes. Then, 6 mL of 1 M hydrochloric acid was added and titrated with 0.05 M sodium thiosulphate solution. When the liquid became straw color, 1 mL of starch solution was added. The liquid became dark blue color again and titrated until the colorless content was obtained. From the experimental data, sugar content in sample can be calculated [5].

Mineral Content

Mineral contents were measured by applying EDXRF (Energy Dispersive X-Ray Fluorescence) spectroscopy.

III. Results and Discussion

The results of nutritional composition of three samples were shown in Table 1, 2, 3, 4, 5 and 6.

Table 1. Results of pH samples

Nutritional Parameters	Sample-I		Sample-II		Sample-III	
pH	6.7	6.8±0.12	6.6	6.6±0.2	6.9	6.7±0.2
	6.9		6.8		6.7	
	6.7		6.4		6.5	

Table 2. Results of Moisture Content and Ash Content

Nutritional Parameters	Sample-I		Sample-II		Sample-III	
Moisture (%)	8.4	8.4±0.25	8.5	8.5±0.7	6.4	6.5±0.16
	8.7		8.7		6.7	
	8.2		8.3		6.5	
Ash (%)	5.0	4.9±0.1	4.6	4.7±0.14	3.6	3.6±0.15
	4.9		4.9		3.9	
	4.8		4.7		3.7	

Table 3. Results of Fat Content of Samples

Nutritional Parameters	Sample-I		Sample-II		Sample-III	
Fat (%)	23.0	23.1±0.1	23.6	23.6±0.16	21.2	21.4±0.16
	23.2		23.8		21.5	
	23.1		23.5		21.4	

Table 4. Results of Protein of Samples

Nutritional Parameters	Sample-I		Sample-II		Sample-III	
Protein (%)	9.2	9.3±0.25	9.3	9.5±0.2	9.9	9.7±0.2
	9.5		9.5		9.7	
	9.3		9.7		9.5	

Table 5. Results of Carbohydrate Content of Samples

Nutritional Parameters	Sample-I		Sample-II		Sample-III	
Carbo-hydrate (%)	35.0	35.0±0.2	35.3	33.3±0.25	30.33	30.32±0.25
	35.3		35.1		30.32	
	35.1		35.2		30.31	

Table 6. Results of Sugar Content of Samples

Nutritional Parameters	Sample-I		Sample-II		Sample-III	
Reducing sugar (%)	28.0	27.9±0.16	24.0	24.1±0.1	26.0	25.9±0.1
	27.9		24.2		25.9	
	27.7		24.1		25.8	

Table (7) Result for Comparison of Relative Abundance of Elemental Contents in Samples I, II and III

Mineral	Si (%)	S (%)	P (%)	K (%)	Ca (%)	Cu (%)	Fe (%)	Mn (%)
Sample I	0.120	0.069	0.053	0.049	0.009	0.001	0.001	ND
Sample II	0.097	0.070	0.045	0.051	0.023	0.001	0.001	0.001
Sample III	0.112	0.083	0.134	0.055	0.022	0.001	0.001	ND

According to the EDXRF results, the samples contained silicon, sulfur, phosphorous and potassium are significant amount than the others. The presence of heavy toxic metals was

not detected. Based on the aspect of heavy toxic metals, eating pastry is safe for human health.

IV. Conclusion

In this research work, three brands of pastry samples (*Nan-Khatai*) were purchased from local Market, Mandalay and nutritional contents in samples were investigated. The pH contents (6.8, 6.6 and 6.7) were found to be in all samples. Moisture contents in samples were found to be 8.4%, 8.5% and 6.5%. The ash contents were obtained 4.9%, 4.7% and 3.6%. Fat contents (23.1%, 23.6% and 21.4%) were found to be in all samples. Protein contents (9.3%, 9.5% and 9.7%) were observed and reducing sugar contents in samples were found to be (27.9%, 24.1% and 25.9%). Carbohydrate contents were found to be (35.0%, 33.3% and 30.32%). Quantitative elemental analysis data obtained by EDXRF indicated that silicon is highest content in sample I, silicon and sulfur are found to be highest in sample II, phosphorous and silicon are found to be highest in sample III. It can be concluded that three brands of pastry contain valuable nutrients and should be consumed for the nutrient.

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