PRODUCTION AND QUALITY ASSESSMENT OF LOCALLY PRODUCED CHOCOLATE

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Abstract

Cocoa and chocolate have been acclaimed for several years for their possible medicinal and health benefits. It is only recently that some of these claims have been more clearly identified and studied. Chocolate has been consumed as confection, aphrodisiac, and folk medicine for many years before science proved its potential

Keywords
Cocoa powder, chocolate, quality assessment

INTRODUCTION

Cocoa beans are derived from the fruit of the plant theobroma cocoa L. (Bolaji, 2013). In Nigeria, dry cocoa beans is majorly exported as a foreign exchange earner, while a small percentage of the cocoa beans serve as raw materials for cocoa powder, cocoa butter and chocolate products(Joel, et'al, 2013).

It serves as food ingredients which is becoming very popular in the food and confectionary industry worldwide, which is available in a wide variety of colors, flavors and is used in numerous applications (Pius, 2013).

Chocolate has become one of the most

health benefiting effect. This study production and quality assessment of home produce chocolate, produced three samples; Sample A contain; powdered milk – 50g cocoa powder – 220g margarine – 120g roasted peanut paste – 50g roasted soybean powder 30g sugar - 120g shea butter – 20g sample B contain; powdered milk – 50g cocoa powder – 220g margarine – 130g water -230ml roasted peanut paste – 30g roasted soybean powder 30g sugar- 120g shea butter 20g sample C contain ; powdered milk – 50g cocoa powder – 220g margarine – 120g water -230ml roasted peanut paste – 160g roasted soybean powder 30g sugar - 120g. From the result of the sensory evaluation it has been revealed that locally produced chocolate was highly acceptable by the populace using T- test and ANOVA. The proximate analysis shows that the locally produce chocolate has high moisture content (113.41%), carbohydrate (117.68%) and protein (74.67%) but low ash content (0.80%) crude lipid (5.2%) and fiber (0.60%) for the three parameters. Based on these findings it has been concluded that chocolates enriched with peanut and soybeans will be highly acceptable by consumers. Therefore, enrichment of locally produced chocolates using available ingredients will help in reducing malnutrition because of high nutrients content in the locally produced chocolate.

popular foods, types and flavors in the world and a vast number of food stuffs involving chocolate have been created particularly desserts including cakes, pudding, mousse, chocolate brownies and chocolate chip cookies (Wikipedia). Presently there are of 2 known functional food which make positive contribution to health and well-being and one of them is chocolate (Vanda, 2015).

Malnutrition is a condition that occurs when the body does not get enough nutrient and access of the nutrient are consumed, these nutrient include protein, carbohydrate, vitamins and minerals (Grover 2009). In 2009, the WHO estimated that 27% of children in developing countries under the age

of 5 years are malnourished. Approximately 178 million children (32% of children in the developing world) suffer from chronic malnutrition. Although the prevalence of childhood malnutrition is decreasing in Asia, countries in south Asia still have both the highest rates of malnutrition and the largest numbers of malnourished children. Indeed, the prevalence of malnutrition in India, Bangladesh, Afghanistan, and Pakistan (38-51%) is much higher than in sub-Saharan Africa (26%). In Mexico, the most recent national nutrition survey estimated that 1.8 million children under 5 years of age are malnourished.

Underweight, stunting, and wasting forms PCM each represent different histories of nutritional deficits. Occurring primarily in the first 2-3 years of life, linear growth retardation (stunting) is frequently associated with repeated exposure to adverse economic conditions, poor sanitation, and the interactive effects of poor energy and nutrient intake and infection. Low weight for age indicates a history of poor health or nutritional deficiencies, including recurrent illness and/or starvation. In contrast, low weight for height is an indicator of wasting or thinness and is generally associated with recent illness, weight loss or a failure to gain weight.

Malnutrition continues to be a significant problem all over the world, especially among children. Poverty, natural disasters, political problems, and war all contribute to conditions even epidemics- of malnutrition and starvation, and not just in developing countries.

The recent revelation by some health expert in Bauchi, that 800,000 under five children die every year in the country as a result of malnutrition is a learning, if something is not done urgently to remedy the situation about 8,000,000 Nigerian children will likely die in the next ten years.

Chocolate is a typically sweet, usually brown, food preparation of theorem cacao seeds, roasted and ground, often flavored, as with vanilla. It is made in the form of a liquid, paste, or in a block, or used as a flavoring ingredient in other foods.

Chocolate milk is sweetened cocoa-flavored milk. It can be created by mixing chocolate syrup (or chocolate powder) with milk (from cows, goats, soy, rice, etc).

Hot chocolate, also known as hot cocoa, is a heated beverage consisting of shaved chocolate, melted chocolate or cocoa powder, heated milk or water,

and often sugar. Hot chocolate made with melted chocolate is sometimes called drinking chocolate, characterized by less sweetness and a thicker consistency.

Materials and Method
Study Design
The study was an experimental study.

Source of Materials
The materials   (sugar, cocoa powder, milk, soybean and peanut) was purchased from wunti market of Bauchi metropolis.

Equipment for Production
Sieve, bowls, gas, spoons, pot, food weighing scale, tray, cup,and plastic spoon are the materials needed for the preparation

PEANUT
Method of Preparation
The peanuts were cleaned thoroughly by removing dirt and stones, it was washed with clean water and sun-dried and dry-milled to produce a paste.

SOYBEAN
The soybeans were cleaned, washed, fermented, decorticated, sun-dried, toasted and dry-milled to produce soybean powder.
All other ingredients were used as purchased from the market, since they are mostly packaged goods.

Product Development
Three sample of chocolate was produced using locally available ingredient purchased in central market,

Composition of Sample A
Powdered Milk - 50g
Cocoa Powder   - 220g
Margarine   - 120g

Roasted peanut paste - 50g
Roasted Soybean powder - 30g
Sugar – 120g
Shea Butter– 20g

Composition of Sample B
Powdered milk – 50g
Cocoa Powder - 220g
Margarine – 130g
Water – 230g
Roasted peanut paste – 30g
Roasted soybean powder – 30g
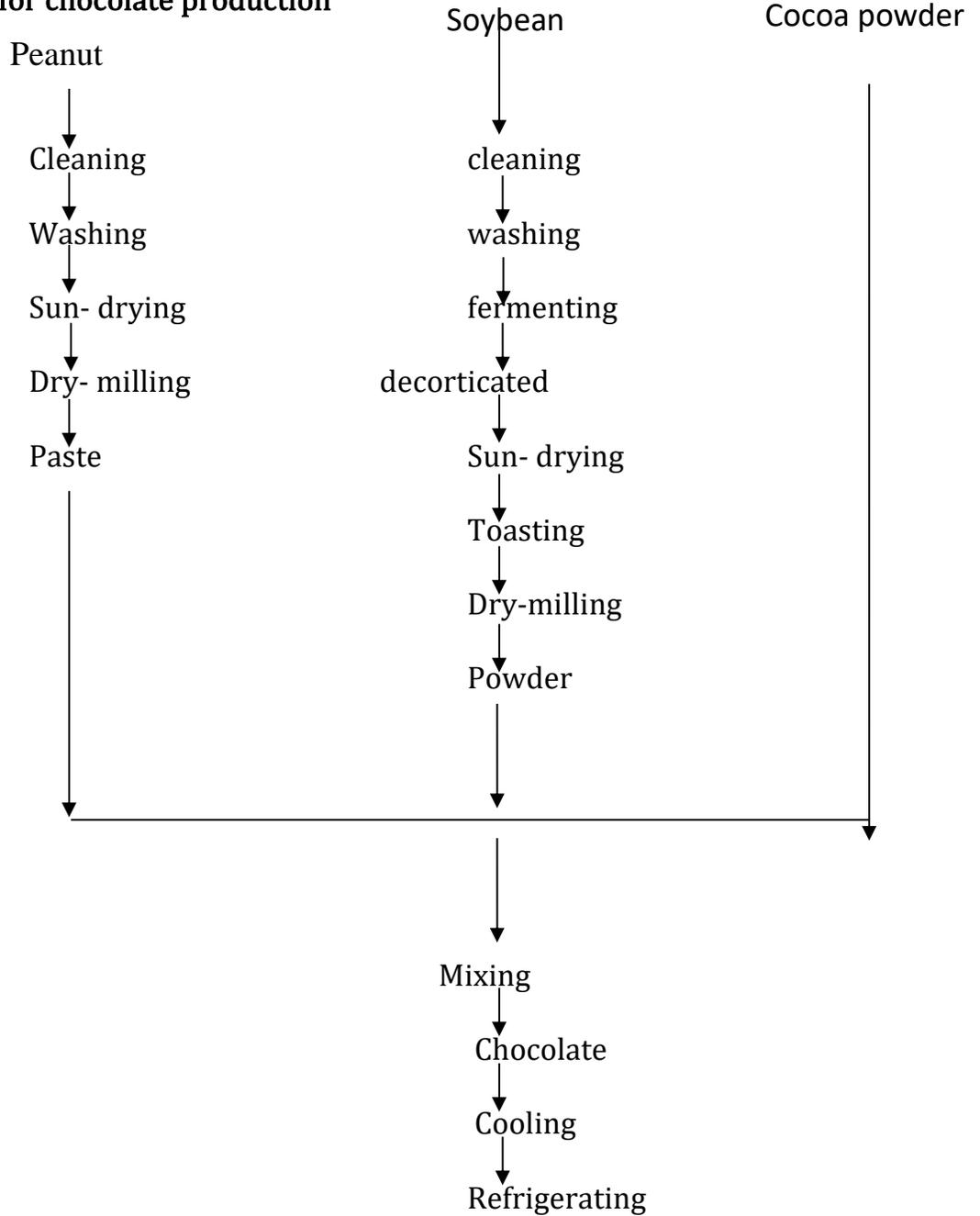Sugar – 120g
Shea Butter – 20g

Composition of Sample C
Powdered milk – 50g
Cocoa powder – 220g
Peanut paste- 160g
Water – 230g
Roasted soybean powder- 30g
Sugar – 120g

METHOD OF PRODUCTION OF CHOCOLATE
Water was heated on a stove and poured in a bowl
120g (1/2 cup) of sugar was poured in it to make syrup.
Powdered milk, butter, cocoa powder, roasted peanuts powder and all other ingredients was added to the syrup.
It was stirred thoroughly and gently
It was allowed to cool in a refrigerator.
It was packed in a clean container and stored in a cool dried place.

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Flowchart for chocolate production

Peanut	Soybean	Cocoa powder
↓	↓	
Cleaning	cleaning	
↓	↓	
Washing	washing	
↓	↓	
Sun- drying	fermenting	
↓	↓	
Dry- milling	decorticated	
↓	↓	
Paste	Sun- drying	
	↓	
	Toasting	
	↓	
	Dry-milling	
	↓	
	Powder	

Mixing
↓
Chocolate
↓
Cooling
↓
Refrigerating

PROXIMATE ANALYSIS
Procedure for proximate composition

Determination of carbohydrate

100 mg of sample was hydrolyzed in a boiling tube with 5 ml of 2.5 N HCl in a boiling water bath for a period of 3 hours. It was cooled to room temperature and solid sodium carbonate was added until effervescence ceases. The contents were centrifuged and the supernatant was made to 100 ml using distilled water. From this 0.2 ml of sample was pipetted out and made up the volume to 1 ml with distilled water. Then 1.0 ml of phenol reagent was added followed by 5.0 ml of sulphuric acid. The tubes were kept at 25-30°C for 20 min. The absorbance was read at 490 nm (Krishnaveni et al., 1984).

Determination of Crude Lipid Content

The lipid content was determined as is provided in the AOAC (1984) method.

Determination of Ash Content

 The AOAC (19840) method was used.

Determination of Crude Fibre Content –

The method described by AOAC (1980) was used.

Determination of Energy Value of Samples

The energy value was calculated using the factors reported by Onyeike et al, 2000.

Determination of Nitrogen and Crude Protein

Protein Digestion The method of Onyeike and Osuji (2003) was used.

Determination of Crude Lipid Content

The lipid content was determined as is provided in the AOAC (1984) method.

SENSORY EVALUATIONS

The three products were evaluated using a 9-scale point based on color, flavor, taste,   consistency and general acceptability.

Twenty panelists were chosen from Federal Polytechnic Bauchi. The results were analyzed using mean and standard deviation.

RESULTS

Table 1: Sensory evaluation

Sample	Flavour	Colour	Taste	Consistency	General Acceptability
A	5.9±1.97	6.55±2.01	4.25±2.42	6.00±2.03	5.4±2.70
B	5.90±1.97	6.55±1.01	4.25±1.43	6.00±1.03	5.40±1.70
C	6.75±1.29	7.30±0.98	6.95±1.35	7.55±1.131	7.15±1.81

The above table shows the sensory evaluation results for the three samples, which include the result for flavor, taste, color, consistency and the general acceptability. Mean values within the column with different superscript are significantly ($p < 0.005$) different.

Table 2: Proximate composition

Proximate Parameters	A%	B%	C%
MOISTURE	113.41	112.7	106.2
Ash	0.80	0.50	0.05
Crude lipid	55.82	5.2	7.90
Fibre	0.60	0.03	0.95
Nitrogen Crude Protein	74.67	64.5	56
Total Carbohydrate	117.68	53.4	58.7
Energy value(kcal)	1271.78	518.4	529.9

This table shows the chemical composition that was carried out on the produced chocolate.

Table 3: Microbial analysis

Time in week	Total plate count(cfu/gm)*10^8	Yeast& Mould count (cfu/gm)*10^3	Coliform count(cfu/gm)*10^3
1	2.3×10^8	ND	ND
2	3.7×10^8	1.6×10^3	ND
3	5.5×10^8	1.2×10^3	ND
4	4.6×10^8	1.0×10^3	ND

This table shows the microbial analysis for the chocolate sample
ND=NOT DETECTED

The observation from the chemical analysis shows that the moisture content varies as 113.41%, 112.7% and 106.2% for A, B and C respectively, it is as a result of the composition n mixing the chocolate. These values are contrary tom the reference manual for U.S milk powders (2005).

The ash content was observed as 0.80%, 0.50% and 0.05% for A, B and C respectively. Ash is an indication of mineral contents of foods and has shown to be high in Cocoa products (Leggli et al., 2011) and it has been reported that chocolates are good sources of minerals, specifically calcium, magnesium, copper and Iron (Afoakwa et al., 2007).

The crude lipid has shown to be 55.82%, 5.8% and 7.90% for A, B and C respectively. The significant differencein the fat content of chocolate was as a result of the contribution of ingredients added in the production of chocolate such as butter, milk powder, shea butter (Borchers et al., 2000).

The observation from the table shows that the fibre content was 0.60%, 0.03% and 0.95% for A, B and C respectively. This is comparatively less which could be as a result of the heating process which could have denatured some fibrein the chocolate (Ndife Joel et al., 2013).

The Nitrogen crude protein and total carbohydrate was observed from the table as 74.67%, 64.5% and 56% for A, B and C, and 117.68%, 53.4% and 58.7% for A, B and C respectively. These values were shown to be significantly high which is due to high percentage composition of powdered milk and Cocoa powder.

DISCUSSION

According to the research the chocolate was produce from locally available ingredient, and has texture, flavor, taste and consistency as the original chocolate, which make acceptable to the populace.

From the general over view of the ingredient we can understand that the chocolate is a calorie dense food. Large amount of protein can be gain from the milk, in addition to other protein and vitamins from soy beans and peanuts, also fat can be gain from the peanuts.

This and other nutrient in the chocolate make it good in terms of preventing anti-treating malnutrition.

The legumes used in producing the chocolate were roasted before milling in to powder or paste, the use of raw (un roast) could lead to the presence of potentially high level of anti-nutritional factors and type (the economist 2008) in addition to that the milk and the legumes used in the formulation of the chocolate help in it protein content.

There was significance difference between the three chocolate. In color, taste, texture, flavor and the general acceptability, but sample c has the highest general acceptability.

Reaches indicated protein should contribute 10.12% of energy value (joint, UN 2007) compared with standard home produced chocolate enriched with peanuts and soybeans is within the range of the standard. The percentage composition of sample A, B, C are 74.67, 64.5, and 56 respectively.

The soybeans and peanut used in the production of the food contribute to most of the protein content (Moscone 2007).

In Nigeria especially in the north where prevalence of malnutrition is very high the locally produced chocolate can be used because of its high protein content.

Also the enriched chocolate contains considerably amount of energy 127.178, 518.4, 529.9   kcal respectively that plays an important role in growth and normal functioning of the body.

The researcher set out to investigate whether chocolate bars containing plant sterols and cocoa flavonols have any effect on cholesterol levels the authors concluded regular consumption of chocolate bars containing PS

and CF as part of a low diet may support cardiovascular health by lowering cholesterol and improving blood pressure (Allen 2008).

CONCLUSION

The findings from this study indicated that chocolate has healthy benefits on human body; also chocolate can be formed using locally available ingredients. The locally formed chocolate was highly acceptable by the populace; the sensory evaluation result indicated that locally produced chocolate can be compared to the standard. The proximate analysis also indicated that locally produced chocolate has high content of moisture, carbohydrate, protein but low content of ash, crude lipid and fibre. Microbial test indicated that chocolate can be kept for a longer period of time without getting spoiled.

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