COMPARATIVE ANALYSIS AND CHARACTERIZATION OF YOGHURT PRODUCE FROM SOYABEANS MILK AND COWMILK

BY

MUSTAPHA LUQMAN ADEYINKA

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DEPARTMENT OF CHEMICAL ENGINEERING

FEDERAL UNIVERSITY OF TECHNOLOGY,

MINNA, NIGER STATE.

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SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY,

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MINNA,

NIGER STATE.

A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF CHEMICAL ENGINEERING IN PARTIAL FULLFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF ENGINEERING (B.ENG).DEGREE IN CHEMICAL ENGINEERING OF THE FEDERAL UNIVERSITY OF TECHNOLOGY

NOVEMBER, 2009.

DECLARATION

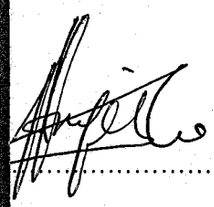
I Mustapha Luqman Adeyinka declare that this project presented for the award of Bachelor of Engineering Degree in Chemical Engineering of the Federal University of Technology Minna, Niger State, has not been presented either wholly or partially for the award of Degree elsewhere to the best of my knowledge.

A.Y. Mustapha ..... 20-01-2010 .....

Mustapha Luqman A. Date

CERTIFICATION

This is to certify that this project "comparative analysis and characterization of yoghurt produce from soya beans milk and cow milk" has been read and approved by the undersigned as meeting the requirement for the partial fulfillment for the award of bachelor Degree in Chemical Engineering (B.Eng). Department of Chemical Engineering, Federal University of Technology, Minna.



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Engr. L. I. Onyeji

Project supervisor

20-01-2010

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Date

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Engr. J. O. Okafor

Head of Department

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Date

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External supervisor

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Date

ABSTRACT

This research work was at studying the comparative analysis and characterization of yoghurt produce form soyabeans milk and cowmilk.

Yoghurt was produced by inoculation of cow's milk and soya milk with freeze dried culture of lactobacillus bulgaricus and streptococcus thermophilus. The processed yoghurt samples were evaluated for chemical microbial properties using existing commercial yoghurt as control. Fat content were high in soya yoghurt 0.34%and cow milk yoghurt0.30%.Ash were highest in cow milk yoghurt0.75% and soya yoghurt 0.66%,there were no significant different in moisture content(soya yoghurt 86.42% and cow milk yoghurt 89.70%)of all the yoghurt samples pH ranges from 4.12 in cowmilk yoghurt to 4.35 in soya milk yoghurt.The shelf life shows that soya yoghurt get sour taste and bad odour after 9 days on shelf and cow milk yoghurt get sour taste after 17 days on shelf . The major bacteria isolated in all the yoghurt sample were Lactobaccillus bulgarcuss and streptoccus thermophilus. Soyamilk yoghurt compared favourably well with cow milk yoghurt in terms of taste,odour,consistency and overall acceptability. Soya milk yoghurt is a good alternative to cow's milk yoghurt.

ACKNOWLEDGEMENT

I like to express my profound gratitude to the Almighty Allah (the pillar of my life) for sparing me to witness the gradual and systematic completion of my first degree and my research project.

My sincere appreciation goes to my supervisor Engr. Lawrence Onyeji for his tireless effort and intellectual criticisms in the course of this project. My profound gratitude also goes to my parent Mr. and Mrs G. Mustapha for their unflinching support, care, love and prayers during the course of my studies. I can not forget my brothers; Mustapha Muideen, ILias (Babs), Ibraheeem and Habibullahi Adebisi for their love, prayers, generosity, support and assistance through my days in the University.

My sincere appreciation goes to my sponsors, Prof. Dibu Ojerinde Registrar JAMB, Abuja, Dr. J.O. Olabisi, Deputy Director. (F&A) JAMB Abuja, Hon.Mudasthir Sekoni, Alh Kola Rahman NECO HQ Minna, Alh. Ridwan, Sekoni Ademuyiwa, Mr. Gbenga Agoro, Mr Ibrahim Adekunle,

My sincere gratitude also goes to my colleagues and friends: Ishola Habeeb, Taheer, Tawa, Azeez, Orekan, Niyi, Muhammed , Nathaniel, Tunde, Donald,Onimago, Samson, Bakkey,other colleagues that make my stay in Minna conducive : Adetola Aliu, Sekoni Mustapha, Usman Lukman and Tijani Jamiu and all whose work I found indispensable in the course of this research project.I thank you all

Finally, my deep appreciation with humble gratitude goes to guardians: Mr Adetola I. Ademola (chief), Alh.S. Ajibade, Mr. Adigun Jimoh (Orunmila), Mr. Sekoni Hammed JAMB Abuja, Mr Rasheed Sekoni. I appreciate your support and prayers. May the good lord reward you all (amen)

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Engr. L. I. Onyeji Date

Project supervisor

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Engr. J. O. Okafor Date

Head of Department

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External supervisor Date

CHARPTER ONE

1.0 INTRODUCTION

Soya beans yoghurt is made by fermenting soya beans milk with friendly bacterial mainly lactobacillus bulgaricus and streptococcus thermophilus the process is similar to the production of yoghurt from cow milk. Yoghurt is semi-fluid milk boiled and concentrated by evaporation. The sugar are fermented by the bacteria into lactic acid, which causes the formation of the characteristics curd. The acid lowers the pH of the yoghurt to about 4.0 and restricts the growth of food poisoning bacteria. The bacteria produce lactase which breakdown the lactose into diary milk. Soya beans milk does not contain lactose but other sugars such as starchyose and raffinase (Okafor, 1990).

The formation is caused by the addition of culture bacteria. The thickness of the yoghurt is the result of the acidification by the Lactic Acid Bacteria (LAB). Yoghurt appears as whitish liquid substance but in some cases, flavor is added to bring about alteration in colour and taste. Bulgarius can easily extend the shelf life of the milk from few days to weeks. (Example of such post fermentation process includes heating, concentration, freezing and drying, but it is evident that such treatment will alter the characteristics of the the product) (Okafor, 1990).

The bacteria are found in a good environment in the milk solution to multiply at a geometric rate there by bringing about the sourness in taste. The temperature conducive for the reaction is between 39^0 and 43^0C. Before the fermentation, pasteurization which is the process of heating the milk to temperature between 55^0 and 70^0C in order to destroy the harmful bacteria without materially charging the nutritive value of the liquid (Magnus, 1994) takes place. The process is named after a French chemist Louis Pasteur who derived it in 1865 to inhibit the fermentation of wine and milk (Pet smith and Johnson matts,1978). The milk is pasteurized by heating at a temperature of 63^0C for 30 minutes and allowing to cool and then store at a temperature of 10^0C (Mgnus,1994).

Soya beans (Glycine Maxima.), the primary material for milk production has been identify to be one of the most important legumes of the tropics with high protein content. It is a potential food material that contains all essential amino acids that are very important for the

proper development of the body.Indeed soya beans, have higher contents of lysine in comparison to other plant proteins. Soya beans when processed give soyabeans milk can be converted to yoghurt; a valuable protein supplement or substitute for adult and infant feeding. Soyabeans milk which can be consumed by the lactose intolerant people as a substitute to milk (Piper,C.V and Morse W.J,1993).

Preservation is added to improve yoghurt consistency. These are generally additives, which prolong the life span of foods and drinks by preventing micro-organisms and to prevent the foods from fermentation and spoilage with out causing any harmful effects to the person who consumed the food. The use of chemical preservation enhance food quality and enhance consumer acceptability (Piper,C.V and Morse W.J,1993).

These chemical preservation are classified into three main types, Antimicrobial (such as Benzoic acid Propionate, Di-methyl pyrocibon-ates), Ascorbic acid and its derivatives are added to milk and yoghurt to inhibit the rancidity and spoilage rate of the yoghurt. Likewise Ninsin is used in preserving yoghurt. A culture of lactoperioxidase is also used to preserve yoghurt because it damages the inner membrane of bacterial.(Okafor,1990)

Most preservation are readily available since they can be synthesized in the laboratories.

COW MILK

Milk is the secretion of the mammary glad of animals that the young once sucks. However, when the term "milk" is used, it usually refers to the milk of cows and is defined as the lacteal secretion, practically free from colostrums, obtained by the complete milking of one or more healthy cows. The early lactation milk is known as colostrums and carries the mother's antibodies to the baby. It can reduce the risk of many disease in the body.The exact components of raw milk varies by significant amount of saturated fact, protein, and calcium as well as vitamin C.Cattle`s milk has a pH ranging from 6.4 to 6.8, making it slightly acidic(Edelsten, 1988).

Nature designed milk as a food for the young. Thousand of years ago, mankind learned of the possibilities of both milk and milk products as a food not only for the young but also for adults. Accordingly, through selection and breeding, man had greatly increased the milk

producing functions of those animals.Regional and climatic influences, determine to a great extent the kind of animals whose milk is used. The cow is adapted to temperature zone and the people of Europe and in those regions where they have migrated, such as North American, Australian, and New Zealand are the main users of cowmilk and its product (Edelsten, 1988). In southern Europe the buffalo is used (Edelsten, 1988).Although the species mentioned above are sources of milk, the cow supplies by far the largest proportion of this product. Therefore, most of the scientific information is centered on cowmilk (Edelsten,1988).

Milk is a complex mixture of lipids (3.8%), carbohydrates (4.7%), protein (3.2%), water (87.5%), and many other organic compounds and inorganic salts dissolved or dispersed in water. It is not a uniform mixture. Many of the milk of the components vary quantitatively and qualitatively both between and within species (Edelsten, 1988). The major milk components studied most extremely are protein, fat, lactose and minerals; minerals are usually grouped and reported collectively as Ash (Edelsten, 1988).

But with all these nutritional importance attached to milk and milk products, it is known that many adults, particularly in Africa and Asia can tolerate only small quantities of milk at a time because they have lost the ability to digest lactose. Lactose intolerance, as this condition is generally called is not uncommon in malnourished children(Okafor, 1990), and also the problem of high cholesterol content. If one of the disadvantages of milk is lactose intolerance and high cholesterol content, therefore, there is the need to provide an alternative product. The majority of alternative products are mostly made up of soya and involved several disadvantages such as anti-nutritional factors, a reduction of their nutritive value as a result of heat treatment at high temperature and or repeated heat unpleasant flavours and consumer mistrust due to possibility of transgenic species of that plant having been used. Effort has been made by many scientists to reduce or eliminate the problem of this biologically active substance in soyabeans. Improvement in the nutritive value of this leguminous seed and others like cowpea, limabeans and soya beans which contain trypsin inhibitor (Okafor,1990). Though soyabeans has been used as milk substitute.

1.1 AIMS AND OBJECTIVE

This research project is designed to study the comparative analysis and characterization of yoghurt produces from cow milk and yoghurt produced from soya beans, while the specific objectives of this project research includes;

a. Production of soyamilk from soyabeans.
b. Production of yoghurt from cowmilk
c. Comparing yoghurt produce from cowmilk with yoghurt produce from soyabeans.
d. Characteristics of the two yoghurts.

1.2 Justification

The main consideration in product developments includes;

Cost: is the cost effective?

Environmental consideration: Does the product have any effect on the environment?

Labour: Does it create job opportunities?

Resources: does it require the use of indigenous or local resources?

People: does it promote self respect and independence?

1. This project is about the effective processing and utilization of locally available raw materials thus ensuring all year round availability of the product.
2. The project has a good market prospect because the product is consumed all over the world; there will be demand for it.
3. The product can be consumed or taken by all; children, adults and old people most especially patients in the hospital.
4. It directly generates employment in the catchments area of the factory and indirectly thousands of people who will be marketing the products.

CHARPTER TWO

2.0 LITRATURE REVIEW

2.1 History of Soya Beans Milk

Soya Milk is made by soaking Soya beans, grinding them with water. The fluid which results after sieving is called soya milk. Most of the soya milk available in the market is flavoured and fortified with extra calcium or vitamins. The most popular flavours are Vanilla and chocolate. Traditionally, soya milk has a beany taste which is well accepted by the Chinese, but less by the western palate. By using correct processing techniques, this beany taste can be reduced or eliminated (Piper,C.V and Morse W.J,1993).

Piper and morse, 1993, reported that Whai Nain Tse introduced soya beans milk to China more than 2000 years ago. Soya beans milk with some added sugar is drunk by the Chinese in early morning and also eaten as a thin broth with salted pickles. It is highly consumed throughout china. It is produced in factories and delivered in bottles to regular customers.As a result of improved processing method which reduced considerably the objectionable flavor, the quality of the milk has been developed. In Nigeria during the time of civil war 1967-1970, soya beans milk helped to avert mal-nùrition in the war affected areas (.Piper,C.V and Morse W.J,1993).

2.1.1 Nutritional value of soya beans milk.

Plain soya milk is very nutritive; it is an excellent source of high quality proteins, isoflavours and B-vitamins. Soya milk is free of the milk sugar (lactose) and is a good choice for people who are lactose intolerant. Also, it is a good alternative to those who are allergic to proteins of cow's milk (Okafor, 1990).

Modern soya milk contains added vitamins and carbohydrate content than the unfortified soya milk.For infant is high in carbohydrates and low in fat and protein than the other soya milk produced. According to (Smith 1946). Soya beans were used extensively during the Japanese invasion of China for feeding babies and children in refuge camps.

Soya milk can substitute cow milk in most diets either completely or in mixture. Although, it contains less calcium than cowmilk, it is richer in iron Thiamine Niacin and

contains more protein than cowmilk, Nutritionally; soya milk protein has nealy a balance content of essential amino acid (Shurtleff, 1984).

2.1.2 Soya beans as a Raw Material

Soya beans (Glycine Maxima) is one of the five mostly pea beans legumes of the tropics. The others include cowpea, peanut, pigeon pea and beans. Soya beans has been a nutrition`s food product for thousands of years. Soya beans belong to the family of leguminous, subfamily papiliondese and genus Glycine Maxima (Chang,Y,J and Brittin,H.C,1990).

Soya beans is erect, bushy and leafy and may vary in height from 30-180cm.The colour of the seed coat may be yellow brown or black or these combinations. Soya beans originate in the far East Asia where they have several as an important part of the diet and as a medicine for many centuries. Soya beans are best known for high protein content but increasingly are being recognized as having potential roles in the prevention and treatment of chronic disease such as cancer and heart disease (Magnus,1994).

In Nigeria, soya beans were first cultivated in Namaru Kaduna state in 1928. This success led to the evolvement of a National programme which resulted in the Massive distribution of viable seeds to indigenous farmers to grow on large commercial scale. The essence of the research carried out on the crop at the plantation was to determine amongst other things the Edaphic (Biotic) and climate (abilitic) conditions under which the legume will give maximum output. It was intended to determine the susceptibility of the legume to agricultural pest and diseases that attack crop plant (Okafor,1990).

2.1.3 Features of Soya beans.

The soya beans (Glycine Max) are a species of legume to East Asia. The plant is sometimes referred to as bean . The pods, stems and leaves are covered with fine brown or gray heirs. The leaves are trifoliate having 3 to 4 leaflets per leaf and the leaflet are 6-15cm (2-6inches) long and 2-7cm (1-3inches) board. The leaves fall before the seed are matured. The big flowers are borne in the axial of the leaf and are white, pink or purple. The fruit is having pod that grows in clusters of 3-5, each pod is 3-8cm long (1-3inches) and usually contains 2-4 seeds which are 5-11mm in diameter (Singh S.K,1996).

Soya beans occur in various sizes and in many seed coat colours, including black, brown, yellow, green and mottled. The hull of the mature beans is hard, water resistant and protects the cotlyledon and hypocotyls from damage. If the seed coat is cracked, the seed will not germinate. The scar visible on the seed coat, is called the hilum (colours include black, brown buff, gray and yellow) and at one end of the hilum is the micropyle, or small opening in the seed which can allow the absorption for sprouting (singh S.K,1996).

2.1.4 Soya beans protein

Soya beans protein or isolated soya beans protein is widely in the food industry (Okafor,1990) and in many food products including infants formulas, and health foods because soya beans contains several biologically active components of which proteins are of particular interest due to their estrogenic activities. On a dry weight basis, the seeds contain 40-45% protein that contributes to functional characteristics in a variety of foods (Okafor,1990). Soya beans meals or cake as it has beans called is generally regarded as cattle feed or occasionally as fertilizer, the use of soya beans protein for poultry, Swire and other animal feeds was not developed until the 1930`s.The protein and lipids in soya beans are the principal pants of commercial interest accounting for approximately 60% of the seed (Orthoefer, 1978).

2.1.5 Soya beans enzymes.

The beany flavor of soya beans is primarily the result of an enzymatic compex-lipoxygebases (Piper, C.V and Morse W.J,1993). Commercially, lipoxygenases are considered of major importance because these catalyse the oxidation of lipids, forming fatty acid several chemicals compound are responsible for the unacceptable soya beans flaovur, but for the reaction to occur, lipoxygenase, damage seeds with exposed substrate (Linoleum and linoleum acids) and water are necessary (Piper, C.V and Morse W.J,1993).

2.2 HISTORY OF COWMILK

Cow milk is as ancient as mankind itself.It is the substance created to feed the mammalian infant. All species of mammal, from men to whales produce milk for this purpose.Many century ago, perhaps as early as 6000-3000BC ancient man learned to domesticated species of animals for provision of milk to be consumed by them. These include

cows,sheep, goats and camels, all of which are still used in various parts of the world for the production of milk for human consumption (Friezer,1989).

Fermented product such as cheeses, yoghurt, were discovered accidently, but their history has also been documented for many centuries, as has the production of concentrated milks, butter, and even ice cream (Friezer,1989). The role of milk in the traditional diet has varied greatly in different regions of the world. The fresh milk has being traditionally preserved other than refrigerating, include immediate consumption of warm milk after milking,by boiling or by conversion into more stable milk after by boiling or by conversion into more stable products such as fermented milks (Friezer,1989).

2.2.1 Milk Composition

The role of milk in nature is to nourish and provide immunological protection for the mammalian young. (Klare S.M,1951). Milk and honey are the only articles of diet whose sole function in nature is food. It is not s surprising, that the nutritional value of milk is high.

2.2.2 Micro-Organism in Milk.

Milk is sterile at secretion in the uuder but is contaminated by bacteria even before one leaves the . Except in the case of mastisis, the bacteria at this point are harmless and few in numbers (Klare S.M,1951). Further infection of the milk can take place during milking, handling, storage and other pre-processing activities.

Lactic acid bacteria: This groups of bacteria are able to ferment lactose to lactic acid. They are normally present in the milk and are also used as starter culture in the production of cultured during as yoghurt (Klare S.M,1951).

2.3 Cow Milk Yoghurt

Yoghurt is a fermentable milk product that evolved empirically some centuries ago by allowing naturally contaminated milk to sour at a warm temperature, probably in the temperature range 40-50^{0}C (Ihekorenye,1985). Yoghurt is one of the most complete food that has been recommended for ages. Domestication of animals such as cow and availability of yoghurt supplies to that required to feed the young meant that animal yoghurt become part of the adult

human diet. Many animals are exploited to yoghurt for human consumption. Cows, sheep and more of all forms are the basis of commercial yoghurt production in various part of the world (Ihekorenye,1985).

According to(Ihekorenye,1985) the flavor and quality of yoghurt is much related to the fermentation carried out by the inoculated spcies of bacterial lacto bacillus bulgericus initiates the fermentation of lactose to lactic acid, reduces product redox potentially by removing oxygen and cause some milk protein breakdown through the production of photolytic enzymes. This also creates favorable condition for the development of more lactobacillus bulgaricus which begins to begins to develop when it has dropped to a value of about pH 4.. The final products usually contain some 10 celll per milli liters of each bacteria species (Ihekorenye,1985). The characteristic flavour of yoghurt is due to the lactic acid and trace amount of ethanol, dimethylpropane volatiles product by bacterial fermentation. Lactobacills bulgaricus is mostly responsible for the production of acetaldehyde (Ihekorenye,1985)

According to Magnus, (1994), long life version of yoghurt has been successfully produced by a variety of methods including drying, freezing and pasteurization but, yet is of little commercial importance.

2.3.1 Nutritional benefit of cow milk yoghurt.

The main benefit of yoghurt is that, like other diary foods, it provides protein, calcium, vitamins and other minerals. Numerous health benefits beyond its nutritional values have been associated with consuming yoghurt. Scientific have found that intake of yoghurt with cultures may aid digestion, ease diarrhea, boost immunity, fight infection and protect against cancer [NCD copyright, 2000]. This specific health benefit depends on the strains and viability of the culture on yoghurt. This is why it is important to choose yoghurt with a seal indicating that it contains like active cultures.

2.3.2 Methods use in producing yoghurts.

The production of soya beans yoghurt is not similar to that of dairy yoghurts. To produce 1 liter of soya yoghurts, you need 140grams of soya beans and a starter. The process start from putting the soya beans in a pan and pouring 3 liters of boiling water to the soya beans. Allows it

to cool down for about 6-12 hours. Drain the beans, add one liter of cold water milk it in a blender for 3 minutes. Remove the soyamilk from the solved by squeezing the mixture using a chease clothes. Heat the soyamilk to boiling point and continue using for 10 minutes.

2.3.3 Culturing the yoghurts.

Bring the milk to 42-45^{0}C (either by cooling the boiled milk or by heating the milk). The culture will only thrive in a narrow temperature range, too cool and it won't be active, too hot and it will die. Measure the temperature with a thermometer. Add 4 tablet spoon of stater to the milk and mix well with a sterile spoon. If yoghurt machine is not available, it can be put in an oven at (42-45^{0}C). aftar about 5-6 hours, when the yoghurt get firm, chill the yoghurt.

2.3.4 Making the yoghurt thicker.

To improve the thickness of yoghurt, add one level teaspoon of corn starch powder, which is premixed in 50ml water, to the milk when it starts boiling.Arrowroot can also serves as a thickener. Disperse 2 teaspoon of starch in 30ml cold water and this mixture to the milk just before boiling.

Table: 1 Chemical composition of soymilk in comparison to Cow milk.

	Parameter	Soymilk	Cow milk (100%)
1.	Water	92.5	87.0
2.	Protein	2.4	3.5
3.	Fat	1.5	3.9
4.	Carbohydrate	2.1	4.9
5.	Ash	0.5	0.7
6.	Calcium	21.0	118.0
7	Phosphorus	47.0	93.0
8.	Iron	0.7	0.1
9.	Thiamine	0.09	0.04
10.	Ribloflarin	0.04	0.17
11.	Niacin	0.3	1.0

Source; Soya beans for health, longevity and economy

2.4 Methods of Producing Yoghurt.

2.4.1 Homogenizing

Homogenizing is a process in which milk is forced through a small opening or aperture under such a high pressure that fat globules are reduced to prevent fat from curding. Homogenizing is done under pressure of about 150-200psi. The fat globules of homogenized milk are smaller and uniformly dispersed in milk it has been reported to enhance sensory quality in soymilk.

2.4.2 Pasteurization

This is done to milk in order to destroy spoilage and pathogenic organism that may be present in the milk. It helps to improve or prolong the shell-life.Pasteurization is done in two ways the milk pasteurized at 72^0C for 15seconds. This is a high temperature short-time method. It is widely used due to effectiveness. The other method is pasteurization at 90^0C and held for 30minutes. This method is otherwise known as holding method and unlike the former method the Vat method is a bath method after-treating the milk is cooled to $(38\text{-}42)^0$C.

2.4.3 Inoculation.

1-3% of the already starter culture is added to the pasteurized milk at 42^0C,which causes the transformation of milk sugar lactose into lactic acid.

2.4.4 Care and storing of yoghurt

As yoghurt contains live acid-producing bacteria, like lacto-bacillus, burglarious and streptococcus thermophillus, it is essential that it is stored in refrigeration. Apart from the addition of preservation for prevention against deterioration.

The recommended storage times are;

1. In freezer natural yoghurt (i.e. yoghurt that has no flavouring) is not recommended to store, the natural yoghurt; it may be possible to recommend the liquid with loss of flavor or food value.
2. In refrigerator about 5-7 days with consistent supply of power because insufficient power supply will make the product to deteriorate. (Freezer, 1989).

2.4.5 Preservation

Preservations are generally additive which prolong the life span of foods and drinks by preventing micro-organism attack. In a more technical term. Preservations are chemical used to poison micro-organisms and to prevent the food on to which it is added from fermentation and spoilage without causing any harmful effect to the person who consume the food. The use of chemical preservations enhances acceptability (Freezer, 1989).

CHAPTER THREE

3.1 EQUIPMENT/MATERIALS

- sterilized or distilled water
- potassium metabisulphate and sodium benzoate
- Filter cloth
- Thermometer
- Starter culture
- Sugar
- PH meter
- Clean bottle for storage
- Measuring cylinder
- Weighing balance
- Blender
- Refrigerator
- Soya beans
- Fresh cow milk

3.2 METHODOLOGY

3.2.1 Preparation of soymilk

Three hundred grams (300gm) of soya beans was weighed into container, two liters of tap water added to soak the **soy**beans**.** The soya beans was allowed to soaked for 18 hours. This was to enable proper absorption of water into the cotyledon and to ease decoating. The beans were wet milled with 1.5 liters of water Soyamilk was obtained by passing the slurry through 0.04mm screen. This was followed by boiling to 100^0C holding for 30minutes.

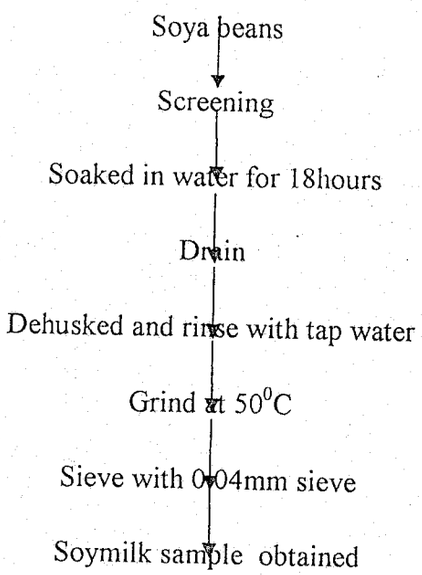
3.2.2 Preparation of Soya Yoghurt

The soyamilk heated to 100^0C allowed to cool to 45^0C. It was then inoculated with a stater culture containing lacto-bacillus bulgericus and streptococeus thermophilus. This was

allowed to ferment for 4hours. After fermentation 0.1gm of sodium benzoate and 2gm of gelating were added to 100ml of the fermented soymilk. These serve as preservatives and stabilizer respectively.15gm of sugar was added to the fermented milk to improve taste. It was then homogenized with the help of a blender, bottled and chilled.

3.2.3 Preparation of Cow milk Yoghurt

Hundred grams (100gm) of diary milk extracted from cow pasteurized at 94^{0}C to kill the contaminant present in the milk .The milk was inoculated at 38^{0}C -43 ^{0}C with a starter culture that contain Lactobacillus bulgaricus and streptococcus thermophilus. The milk was allowed to ferment for 3-4hours. After fermentation process 0.1gm of sodium benzoate and 2gm of gelating were added to 100ml of the fermented cow milk. They serve as preservation and stabilizer respectively. Also 10gm of sugar was added to enhance taste. It was then homogenized with help of a blender. The yoghurt was bottled and chilled.



ig:1; Method Flow Chart of Soya Milk Production

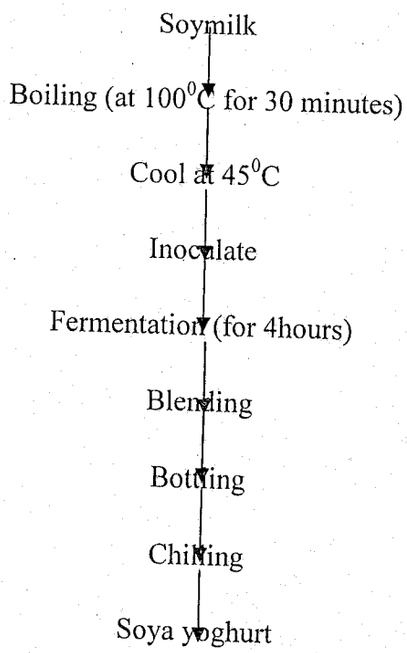


Fig 2. Flow Chart of Soya Yoghurt

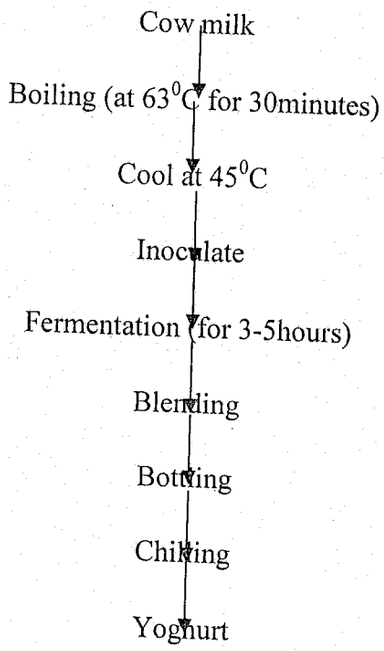


Fig:3;Flow Chat of Cow milk Yoghurt Production

3.3.4 Determination of pH Samples.

The pH meter was switched on and allowed to warm for 30minutes. The pH was adjusted to standardize using distilled water at required temperature (20^0C to 25^0C) and electrode of the PH meter. The electrodes of the sample were dry cleaned and dripped into the different samples and reading was noted. After taking the pSH of each sample, the electrode was cleaned before dipped into the next sample.

3.2.5 Determination of fat content

The Samples were weigh into fat free extraction thimble and pug lightly with cotton wool.this thimble was placed in the extractor and filled up. The soxhlet flask is then filled to 3/4of its volume with petroleum ether (b.pt.40^0C -60^0C).Extractor and condenser was placed on the heater. The heater was put on for six hours with constant running water from the tap for condensation of the ether vapour.The flask which now contain the fat is detached, its exterior cleared and dried to a constant weight in the oven. The percentage fat is obtain.

3.2.6 Determination of ash content.

The samples were weighed in a crucible.This was transferred into the furnace set at temperature 550^0C and left for about 4 hours. About this time it had turned to white ash. The crucible and its content were cooled in air and weighed to calculate for the percentage ash.

3.2.7.Determination of moisture content.

Samples were weighed into petric dish. The petric dish plus sample taken was then transferred into oven set at 100^0C to dry for 24 hours overnight. At the end of the day, the petric dish plus sample was removed from the oven and transferred to dessicator,to allow to cool and weighed.

3.2.7.Determination of Total Solid.

Total solid is determined by

%total solid=100-%moisture

3.3 PHYSICAL ANALYSIS

3.3.1 Determination of the Colour

This was determined byat looking the physical appearance of the both samples.

3.3.2 Determination of Shelf Life of both Samples.

This test was conducted both on the refrigerated and unrefrigerated (ambient temperature) samples.They were kept at temperature 4^0C in the refrigerator. The samples were examined at 4days interval for changes in sensory taste, consistency, and odour and overall stability.

3.3.3 Sensory evaluation of soya yoghurt and cow yoghurt

The format for these tests were represented in random order and identify was coded to prevent bias. The samples were rated on a scale of 1-6 for taste, consistency, odour and overall acceptability.

The numerical scoring/rating of the samples used as follow;

Excellent	6
Very good	5
Good	4
Very fair	3
Fair	2
Poor	1

Where: A represent soya yoghurt

B represents cow yoghurt

After 9 days of storage in refrigerator, 10 persons were asked to observed the samples and their observations were rating as shown above;

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Results

Table 2; Proximate analysis of soya yoghurt and cow milk yoghurt

Analysis	Mean percentage of soya yoghurt	Mean percentage of cow milk yoghurt
Moisture	86.42	89.70
Fat	0.34	0.30
Ash	0.66	0.75
pH	4.35	4.12
Total sold	13.58	10.30

Table 3; Physical analysis of both sample

Observations	Soya yoghurt	Cow milk yoghurt
Colour	Creamy white	White

Table 4; Analysis of variance for taste

No of panelist	A	B
01	6	6
02	5	6
03	5	6
04	6	6
05	4	5
06	3	5
07	4	2
08	2	4
09	5	5
10	3	5
Total	43	50
Sample mean	4.3	5.0

Table 5; Analysis of variance for Consistency

No of panelist	A	B
01	5	6
02	3	5
03	6	5
04	5	5
05	2	3
06	4	6
07	3	4
08	6	4
09	5	3
10	4	3
Total	43	44
Mean total	4.3	4.4

Table 6; Analysis of variance for odour

No of panelist	A	B
01	1	6
02	3	6
03	1	6
04	1	5
05	4	4
06	2	5
07	1	6
08	5	4
09	4	4
10	1	6
Total	23	53
Sample mean	2.3	5.3

Table7; analysis of variance for overall Acceptability

No of panelist	A	B
01	4	6
02	5	5
03	6	4
04	4	4
05	4	5
06	3	6
07	5	5
08	4	6
09	5	4
10	3	4
Total	41	49
Sample mean	4.1	4.9

Table 8; Mean sensory evaluation result

Sample characteristics

Sample	Taste	Consistency	Odour	Overall Acceptability
A	4.3	4.3	2.3	4.1
B	5.0	4.4	5.3	4.9

Table 9; Refrigeration storage of soya yoghurt

Days	pH	Temp^{0}C	Colour	Odour	Taste
1	4.35	4^{0}C	Creamy white	Pleasant	Sweat
5	4.33	4^{0}C	Creamy white	Pleasant	Sweat
9	4.25	4^{0}C	Creamy white	Pleasant	Sweat
13	3.98	4^{0}C	Brownish white	Unpleasant	Sour
17	3.72	4^{0}C	Brownish white	Unpleasant	Sour
21	3.62	4^{0}C	Brownish white	Unpleasant	Sour

Table 10; Shelf storage of soya yoghurt

Days	pH	Temp°C	Colour	Odour	Taste
1	4.35	30	Creamy white	Pleasant	Sweat
5	4.35	31	Creamy white	Pleasant	Sweat
9	4.30	32	Creamy white	Pleasant	Sweat
13	4.25	29	Creamy white	Pleasant	Sweat
17	4.10	30	Creamy white	Unpleasant	Sour
21	3.90	29	Creamy white	Unpleasant	Sour

Table 11; Refrigeration storage of cow milk yoghurt

Days	pH	Temp	Colour	Odour	Taste
1	4.12	4^0C	White	Pleasant	Sweat
5	4.05	4^0C	White	Pleasant	Sweat
9	3.96	4^0C	White	Pleasant	Sweat
13	3.95	4^0C	White	Pleasant	Sweat
17	3.77	4^0C	Creamy white	Pleasant	Sweat
21	3.75	4^0C	Creamy white	Unpleasant	Sour

Table 12; Shelf storage of cow milk yoghurt

Days	pH	Temp°C	Colour	Odour	Taste
1	4.12	30	White	Pleasant	Sweat
5	4.12	31	White	Pleasant	Sweat
9	4.02	32	White	Pleasant	Sweat
13	3.96	29	White	Pleasant	Sweat
17	3.94	30	White	Unpleasant	Sour
21	3.90	29	White	Unpleasant	Sour

4.2 Discussion of Result

The results obtained during the research on the comparative analysis and characterization of yoghurt produced from soya beans milk and cow milk are shown in table 2- 12.

The proximate analysis of soya yoghurt and cow milk yoghurt in table 1 revealed moisture content of soya yoghurt (86.42%) is slightly lower than that moisture content of cowmilk yoghurt (89.70%)lower moisture content in soya yoghurt might due to the production process and sources of the milk.

Fat content of cow milk is lower than fat content of soya yoghurt i.e. soya yoghurt 0.34%, cow milk yoghurt 0.30%. This might be due to the production process. The ash content of soya yoghurt was (0.66%) which is lower than (0.75%) of cow milk yoghurt. This might be due to low insoluble ratio of the Minerals matter in the slurry with the result that only the soluble one are extracted with soy yoghurt.

According to the results obtained during the physical observation, it show that the colour of the soya yoghurt it is creamy white while the colour of cow milk yoghurt is white. The creamy colour depend on the type of soya beans used.

Sensory evaluation revealed that in terms of taste, consistency odour and overall acceptability sample B which is cow milk yoghurt is better.It also shows that there is much significant differences in terms of consistency and in terms of odour sample B is Best because it significant is much and overall acceptability results show that sample is highly acceptable.Results showed that sample B which is cow milk yoghurt is highly acceptable than sample A (soya beans yoghurt).

From the shelf life analysis, the table shows that the product stores at ambient temperature were found to contain more bacteria than those product stored at freezer temperature.Soya yoghurt in shelf got sour after 9 days while the soya yoghurt in the feezer got sour after the 17 days.The result agrees with Wilson (1976) that the effective method for the preservation and increasing the shelf life of the yoghurt is by cold storage.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

From the research carried out and the result obtained, the following conclusions were reached;

Soya yoghurt and cow milk yoghurt were successfully produced. The proximate analyses were determined as well as physical analysis, sensory evaluation as well as keeping quality (shelf life).The storage conditions at low temperature increases the shelf life of the yoghurt samples gradually lead to loss in odour ,colour, taste and increases in acidity was due to decrease in pH which provides ideal environment for micro-organism to grow.The effective method for preservation and increasing the shelf life of both samples is by cold storage.The results revealed that cow milk yoghurt product is highly acceptable i.e. soya yoghurt can serve as alternative to cow yoghurt.

5.2 RECOMMENDATION

The preserved yoghurt should be stored at low temperature in other to increase its life span

1. Soya yoghurt is highly recommended as a substitute for cow yoghurt.
2. People should be educated of its nutritional content of soya yoghurt and encouraged to increase of production of soya beans.
3. It will also create employment opportunity as many industries will be set up to produce soya yoghurt commercially. People should also be encourage to produce and consume soya yoghurt in their homes,

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APPENDIX 1

Determination of moisture content for soya yoghurt and cow milk

Sample	Weight of petric dish (g)	Weight of petric dish + sample (g)	Weight of petric dish+dry sample (g)
Soya yoghurt	46.15	74.15	49.64
Cow milk yoghurt	46.15	73.58	48.96

Percentage moisture $= \frac{W2 - W3}{W2 - W1} \times 100$

Where; W1 = weight of petric dish

W2 = weight of petric + sample

W3 = weight of petric dish + dry sample

For soya yoghurt $\frac{74.15 - 49.64}{74.51 - 46.15} = \frac{24.51}{28.36}$

Moisture content of soya yoghurt = 86.42%

For cow milk yoghurt $\frac{73.58 - 48.96}{73.58 - 46.15} = \frac{24.62}{27.43}$

Moisture content of cow milk yoghurt = 89.70%

APPENIDX II

Determination of fat content

Sample	Weight of flask (g)	Weight of flask sample (g)	Weight of flask + Extract (g)
Soya yoghurt	0.84	2.85	2.41
Cow milk yoghurt	0.84	2.95	2.22

Percentage fat = $\frac{W2 - W3}{W2 - W1} \times 100$

W1 = weight of flask

W2 = weight of Flask + sample

W3 = weight of flask + Extract

For soya yoghurt $\frac{2.95 - 2.22}{2.925 - 0.84} = \frac{0.6}{1.94}$

= 0.42%

For cow milk yoghurt $\frac{2.78\text{-}2.18}{2.78\text{-}0.84} =$

=0.30%

APPENDIX III

Determination of Ash content

Sample	Weight of crucible (g)	Weight of crucible +sample (g)	Weight of crucible + Ash (g)
Soya yoghurt	10.51	16.55	10.55
Cow milk yoghurt	10.49	15.78	10.53

For soya yoghurt $\frac{10.55-10.51}{16.55-10.51} \times 100 = \frac{0.04}{6.04}$

= 0.66%

For cow milk yoghurt $\frac{10.53-10.49}{15.78-10.49} \times 100 = \frac{0.04}{5.29}$

=0.75%

APPENDIX IV

Total solid is determined by

% total solid= 100-%moisture

For soya yoghurt

% total solid =100-86.42

=13.58%

Total solid for cow milk yoghurt

%total solid=100-89.7

=10.30%