Sudan University of Science and Technology

College of Animal Production

Department Of Dairy Science and Technology

Evaluation of Chemical Composition and Sensory properties of dried yoghurt

تقييم التركيب الكيميائي والخواص الحسية للزبادي المجفف

A dissertation Submitted in partial Fulfillment of the Requirement for the Degree of B.Sc (Honour) in Animal Production Science and Technology

By:

Makki Haroun Ahmed Estanbol

Mussa Mohammed Edriss Abdurrahman

Supervisor:

***Dr*: Assia Ibrahim Abdelrahim Mohamamed**

October

1440-2018هـ

List of table

الآيـــــة

قَالَ تَعَـالَىٰ:

﴿ ٱقْرَأْ بِٱسْمِ رَبِّكَ ٱلَّذِى خَلَقَ ﴿١﴾ خَلَقَ ٱلْإِنسَـٰنَ مِنْ عَلَقٍ ﴿٢﴾ ٱقْرَأْ وَرَبُّكَ ٱلْأَكْرَمُ ﴿٣﴾ ٱلَّذِى
عَلَّمَ بِٱلْقَلَمِ ﴿٤﴾ عَلَّمَ ٱلْإِنسَـٰنَ مَا لَمْ يَعْلَمْ ﴿٥﴾ ﴾

سورة العلق: ١ ـ ٥

صدق الله العظيم

Dedication

We dedicate this work to parents
Sisters
Brothers
Colleagues

Acknowledgement

This work we acknowledged first of all, Allah for giving us patience to conduct this work.
Our acknowledgement goes to our supervisor Dr. ***Assia Ibrahim Abdelrahim Mohammed*** and the ***staff*** of Dairy Science and Technology Department.
Our acknowledge extended to ***Us. Awatif Abazzer Abdoalkhliq***

ABSTRACT

The experiment was conducted to produce dried yoghurt by oven drying and to evaluate the chemical and sensory properties of the reconstituted yoghurt.

The experiment was conducted in 1 June - 30 august, 2018 at the Sudan University of Science and Technology, College of Animal Production. Two liters of cow's milk was purchased from the College dairy farm and pasteurized to 85 °c for 15 second, then cooled to 45 °c, starter culture (lactic acid bacteria) were added at the rate 2% , incubated at temperature 45 °c for 3-4 hours, then cooled in refrigerator for 24 hours. For yoghurt drying, it was put in layers, in aluminum foil and entered the drying oven at 55 °c for 42-72 hours. The dry layers were collected, grinding, and then reconstitution yoghurt by adding water to the dried yoghurt at the ratio of 3.5: 1 g, respectively.

The chemical analysis and sensory characteristics were conducted and using mean averages.

The results showed the chemical composition of the reconstituted yoghurt was protein 5.8, fat 3.4, acidity 1.94, total solid 19.51,ash 0.89 (%). Sensory evaluations results were acceptable for color, flavor and taste, while the texture was less cohesive.

المستخلص:

اجريت هذه التجربة لإنتاج الزبادي المجفف عن طريق فرن التجفيف ولتقييم التركيب الكيميائي والخواص الحسية للزبادى المحضر. تم اجراء التجربة في شهر 1يونيو- اغسطس في جامعة السودان للعلوم والتكنولوجيا، كلية الانتاج الحيواني. و تم شراء 2 لتر حليب ابقار من مزرعة الكلية وتم بسترته الى درجة حرارة 85 °م لمدة 15 ثانية، ثم برد الى 45 °م، وتمت اضافة الباديء (بكتريا حامض اللاكتيك) بنسبة 2% وتم تحضينه في درجة حرارة45 °م لمدة 3-4 ساعة، ثم برد فى الثلاجة لمدة 24 ساعة. و لتجفيف الزبادى، ووزع في طبقات على قصدير، وادخل فرن التجفيف فى درجة حرارة 55 م لمدة 42 -72 ساعة. تم تجميع الطبقات المجففة، وطحن و تم تمت اعادة تحضيره باضافة الماء للزبادى المجفف بنسبة (1:3.5) جرام. تم اجراء التحليل الكيميائي والحسي بفرق المتوسطات. واوضحت النتائج ان نسب التركيب الكيميائي الزبادي المحضر : البروتين 5.8 و الدهن 3.4 وتقدير الحموضة بمتوسط 1.94 ونسبة الرماد 0.89 الجوامد الكلية (%)19.51 . و اظهرت نتائج التقييم الحسي على ان اللون والنكهة والطعم كانت مقبولة، بينما القوام كان اقل تماسك.

CHAPTER ONE

1. Introduction

Milk and the range of dairy products derived from milk have long been central to diet in both developed and developing countries; Some dairy processing technology such as fermentation have been used for long lasting foundation have been used for thousands of year. Smit (2003)

Fermented milks are sour milk products from milk whole partially or fully skimmed dried milk homogenized or sterilized and fermented by means of specific dairy product is obscure and its difillcult to be precise about the date when they were first made fermented by lactic acid bacteria the growth and toxicity of the anaerobic, sporefoing bacteria in the large intestine in habited .

Lactic acid is biologically active and capable of the suppressing harmful human viral activities Metchnikoff's Theory of longevity considerably influenced the spread of the fermented milk products to many countries particularly in Europe he also promoted extensive studies concerning biochemical and physiological properties of the fermented milks (Gandhi 2000) .

Afood can be regarded as functional if it is satisfactorily demonstrated to effect beneficially one or more target functions in the body beyond adequate nutritional effects in a way that is relevant to ether an improved state of health an well being and reduction of risk of disease. Smit (2000).

1.1 .The research Problem:

In some areas of the Sudan, such as, Darfur state, in autumn season, in which, the highest availability of milk was produced. and some traditionally home made products are made such as cheese, Berkeep, ghee and roub, which are consumed and in condition of extra milk productions, sometimes was poured on the ground, as considered waste of raw resources.

Due to the lack of power and refrigerator equipment in products preservation, people traditionally used to drying the *Roub* in sun temperature, and consume it in their food meals and were kept and consumed, in travelling.

1.5 .Aims of study:

- To make and produce dry yoghurt by oven drying.

- To study the chemical analysis (total solids, acidity, fat, protein, ash) of the reconstituted yoghurt.

- To study the sensory evaluations of the reconstituted yoghurt.

CHAPTER TWO

2. Literature Review

2.1 Milk:

Milk is a complete food for new born mammals during the early stages of rapid development (Shah., 2000)

Milk is a white liquid produced by the mammary gland of mammals before they are able to digest other types of food. Early- Lactation milk contiants colostrums, which carries the mother's antibodies to young and can reduce the Rick of many antibodies to its young and can reduce the risk of many diseases; milk contents many other nutrients and the carbohydrate lactose (Pehrsson *et al.,* 2000) as an agricultural produced about 730 million tones of milk in 2011 , form 260 million dairy cows .

India is the world's largest producer of milk and is the leading exporter of skimmed milk powder yet has little to no other milk product exports (Faye and Konuspayeva, 2012).

The ever increasing rise in domestic demand for dairy product and a large demand -supply gap could lead to India being a net importer of dairy products in the future (Owen *et al.,* 2005).China and Russia are the world's largest importers of milk and milk products (Heme and Ottel 2010).

2.2 Starter in fermented milk products:

The primary function of almost starter culture is to develop acid in the product .The secondary effects of acid production include coagulation,

expulsion of moisture, texture formation and initiation of flavor production .In addition to these, the starters also help in imparting pleasant acid taste, conferring protection against the principal function, i.e. promote acidification, added microorganisms are referred to starter primary cultures (Topisirovic., *et al*,. 2006).

There are two groups of lactic starter cultures:

Sample or defined: single starin, or more than one in which the number is known

Mixed or compound: more than one strain each providing its own specific characteristics

2.2.1 Types of Fermented Milk:

According to (Kemp, 1984) a variety of traditional as well as industrialized fermented milk products are available nowadays .These can be classified as under One the basis of dominant microorganisms

Lactic fermentation: here LAB species lead to the production of fermented milk products they can be

- Mesophillic – cultured buttermilk, natural acidified milk, cultured cream

- thermophillic - yoghurt, dahi therapeutic acidophilus, bifidus milk fungal lactic fermentation: here LAB species combine with yeast species to give the final product .

- alcoholic milk - kefir, kumis, acidophilus yeast milk.

- moldy milk – viili.

II .one the basis of acid content of the product:

Acid alcohol – kefir, kumiss

High acid- Bulgarian sour milk

Medium acid –Acidophilus milk yoghurt

Low acid – culture butter milk, cultured cream

2.2.1.1 Kumiss

Kumiss is an effervescent, acidic, alcoholic fermented, milky white /grayish liquid mode primarily from mare's milk .it is popular national beverage of Kazakhstan and its origin was in central Asia-Russia and Mongolia .it is also produced under other names such as Kumiss, Kumys Koumiss,

The mare's milk lends it its characteristic nature as it contains less casein and fatty matter and more sugars than cow's milk

2.2.1.2 Kefir:

It is a viscous, acidic mildly alcoholic and distinctly effervescent product produced by fermentation of milk with a kefir grain as starter culture.

The word kefir is said to have originated from the Turkish word keifr which means 'good feeling .its country of origin is caucasusian China .It has been sold in Europe under averity of names including kephir, kiaphur, kefer, kephir .

2.2.1.3 Acidophilus milk:

It is defined as highly acidic product made by fermentation of milk by *lactobacillus acidophilus. L.b .acidophilus* strains are considered to fulfill

most of the basic criteria of probiotics: survival in the gastro intestinal transit, bile and acid tolerance, and production of antimicrobial.

2.2.1.4 Cultured Butter Milk:

It is low acid fermented milk popular in Scandinavian and European countries .it is the fluid remaining after ripened cream is churned into butter.

It is obtained the souring the skimmed milk with mesophillic lactic acid bacteria as starter culture .The original butter milk is really the liquid left after removing the butter from the butter churn which still contained butter flakes carried over from the butter making process .

Now days cultured butter milk is the made from skim milk or low fat milk which is pasteurized at 82-88c for 30 min .Then cooled at 22c and inoculated with the *Loctococcus lactis subs p* . and subs pcremorispror lactic acid Production .For aroma and flavor production .(Subrota *et el.*, 2015)

2.2.1.5. Bulgaricus butter Milk:

It is a sour milk produced using lactobacillus delbrueckii subsp blugaricus alone (Marshall,1984).the steps in the manufacture are the same of that cultured butter milk Heated milk 85 c for 30 min is inoculated at 42 c for 10-12 hours .

The has a clean flavor and sharp acidic taste reminiscent of yoghurt suggesting that the lactobacillus metabolize some of the milk component to acetaldehyde .it is high acid milk in which total acidity (as lactic) my reach from 2.0 to 4.0 per cent (Kosikowski,1977) .

2.2.1.6. Dahi:

It is a popular India fermented milk product that is quit analogous to plain yoghurt in appearance and consistency .it is popular with the consumer due to its distinctive flavor and because it is believed to have good nutritional and therapeutic value .it utilized in various forms in many Indian culinary preparations .it is defined as product obtained by lactic fermentation of cow or buffalo milk or mixed fermentation accompanied by alcoholic fermentation by yeast .Traditionally it is made from the starter known as jamun or khatta which is the left over dahi from previous lot .The organisms commonly found in the indoculums are L *.lactis subsp. Cremoris ,Lactis subsp .L,S .thermophilus, L .acidophilus ,L .delbrueckii subsp. Bulgaricus*. A good quality dahi is of firm and uniform consistency with a sweet aroma and clean taste acid taste. The surface is smooth and glossy and a cut surface is trim and free from cracks and air bubbles; Chakka is a concentrated product obtained after draining the whey from dahi. When it is blended with sugar and other condiments, it becomes Shrikhand, referred to as Shikhrini in old Sanskrit literature. This has been very popular dessert in Western India for several hundred years, (Batish *etal.*1999).

2.3. Health Benefits of Yoghurt:

Convincing evidence from several studies indicate that lactose intolerant individuals suffer fewer symptoms if milk in the diet is replaced with fermented dairy products and functional prebiotic containing foods.

Due to partial hydrolysis of lactose during fermentation, the reduced levels of lactose in fermented products relative to milk may contribute to the greater tolerance of yoghurt.(de Vrese *et al*.,2001).Most of the lactose, the principal carbohydrate in milk , is lost in whey during cheese

manufacture and hence most cheeses contain only trace amounts of carbohydrate. The residual lactose in cheese curd is usually fermented to lactic acid by the starter bacteria. Thus, cheeses can be consumed with – outill-effects by lactose –intolerant individuals who are defincient in the intestinal enzyme , β- galactosidese (O' Brien and O'connor , 2004)

Clinical studies have shown the lactobacillus and bifidobacterium species reduce lactose intolerance, alleviate some diarrhea lower blood cholesterol, incearse immune response and prevent cancer (Marteau and Ramband 1996,Gillilind 1996 Salminen *et al*., 1998). LAB can be effective in the preventing gastrointestinal disorder and in the recovery of diarrhea of miscellaneous causes (Marteau et al. 2001), causes relief of constipation (Oyetango and oyetango 2005). They also help in decreasing Heliobacterpyroli infection, reduction in the cholesterol and certain allergies etc. (Sanders, 2012) .

Certain strain of *bifidobacteria* and *lactobacillus* produce conjugated linolei acid (CLA) isomers and enhance the health properties by reducing the risk of anther o sclerosis (Yadav *et al.*, 2007). The inhibitory effect of LAB to various pathogenic bacteria and spoilage organisms is due to the rapid growth and acid production by LAB, the consequent decrease in PH and formation of other microbial factors associated with LAB, such as bacteriocins, hydrogen peroxide, ethanol and diacetyl (Caplice and Fitzerald ,1999).

The protective properties of LAB due to antimicrobial activities are useful in food fermentation , making food safe to . eat .the consumption of LAB in fermented food without any adverse aGRAstaus , and there for their bacteriocins might have potential as bio preservatives LAB compete with the other microbes by the screening antagonistic

compounds and modify the microbial to survive and grow in the intestinal tract.

Many benefits are attributed to fermentation .it can preserve food (i.e. increase its shelf life).

Improve digestibility enrich food and enhance taste and flavor .it is also an affordable technology and thus is accessible all population. Furthermore fermentation has potential enhance food safety by controlling great number of pathogen in foods. Thus make important contribution to human nutrition particularly in developing countries where in economic problems are major barrier in ensuring food safety. (Adam, 1999)

2.4. Safety concerns fermentation

Although it may seem simple Fermentation is delicate complex technology the safety and quality of the fermented product , beside being dependent on the quality and safety of the starter culture also depends on the processing condition, the level of the hygiene, the final acidity of the product and the quality of the raw milk materials .In case of cottage industry or household application of fermentation it may be difficult to control the factors adequately .Over the past few decades many countries have been a significant rise in incidence of disease caused by *salmonella spp., Campylobacter spp. ,and Escherichia coli* (Adams and Nout, 2008).

2.5. Yoghurt:

yoghurt is produced using active cultures of bacteria of fermented milk .

It is defined as a coagulated milk by *Streptococcus Thermophilus* and *lactobacillus delbrueekii sub sp. Bulgaricus.* Yoghurt products may also have added ingredients such as sugar sweeteners fruits or vegetable flavoring compound sodium chloride, coloring stabilizers and preservatives, hence it is available in various forms ranging from plain traditional type with sharp acidic taste to dried, Subrota *et al*., (2015).

2.5.1 Dried yoghurt/powder yoghurt

Yoghurt powders possess various nutritional and therapeutic values. Antitumor activity is associated with the cell wall of starter bacteria and so the activity remains even after drying.; The primary objective of drying is to preserve it in a shelf stable powdered form of high quality without need for refrigeration .such as powder can be prepared by various methods such as freeze – drying, spray-drying, microwave-drying and vacuum drying. Before drying, it is beneficial to concentrate yoghurt by methods including cloth bag method, mechanical, centrifugation, ultrafiltration and vacuum concentration; Str. thermophilus shows less sensitivity in comparison to L. bulgaricus, during freeze-as well as spray –drying of yoghurt. Kumar and Mishra (2004).

The primary objective of manufacturing powdered yoghurt is the product that is stable although wide range of patents have been filed in many countries (Tamime and Robinson, 1999)

The processes were not successful in producing gel type yoghurt when the powder was rehydrated nevertheless, dried yoghurt widely used in the food sector in the manufacture of sauces, soups baked goods and baby food the manufacturing techniques of drying milk and yoghurt have been reviewed by Masters (1991).

Yoghurt has improved the following characteristics of the product when compared with ordinary dried yoghurt retetion of volatile compound such as acetaldehyde and solubility and dispersion of the powder during reconstitution (Ramirez- Figueroa *et al*, 2002, Crofskey *et al*., 2004).

CHAPTER THREE

3. Materials and methods

3.1 .Experimental area:

The study was conducted during the period of July -August 2018 at the Department of Dairy Sciences and Technology, College of Animal production Science and Technology, Sudan University of Science and Technology.

3.2. Materials:

-Dry oven

-Electronic balance

-Aluminium foil

-Spoon

- Milk: Two liters of cow's row milk samples were purchased from the dairy farm of animal production sciences and Technology at Hillat kuku, sterilized containers were used for the collection of milk.

-Yoghurt sample: Starter cultures of yoghurt (*Str.thermophillus* and *L.b bulgarcus*) were purchased from market.

3.3. Yoghurt making:

Yoghurt was prepared as described by staff (1998), 2 liters of cow's milk were pasteurilized in water bath at 85ºc for 30 min and cooled to 45ºc , added starter culture, how much packed then incubated at 45 ºc for 3 hours and then cooled in refrigerator at 4 ºc for 24 hrs.

3.4. Yoghurt drying and reconstitution:

The yoghurt were spread in thin layer on aluminium foil for drying at 55 ºc until drying for 72 hour (Tamime and Robinson, 1999).

Then cooled and grinding.

Then, were used to reconstituted the yoghurt a t the rate of (1: 3.5) dried yoghurt to water (gm/ ml), respectively.

3.5. Chemical analysis:

3.5.1. Fat content:

The fat content was determined by method according to (Bradly *etal.*, 1992) as follows: In a clean dry Gerber tube ,10 ml of sulphuric acid (density1.8 gm /ml at 20 ºc) were poured and then 1o.94ml of prepared yoghurt samples were added. amyle alcohol (1-2ml) was added to the tube, followed by the amount of distilled water, the content were thoroughly mixed till no white particles could be seen the Gerber tubes were centrifuged at 1100 revolution per minute (rpm)for 4-5min.

The fat column was then read immediately.

3.5.2 Protein contents:

The protein content was determined by Kjeldahl methods according to AOAC (1990) as follows:

3.5.2.1 Digestion:

ten ml of prepared yoghurt were weight and poured in added concentrated sulphuric acid (25ml) was added to the flask the flask were heated until a clear solution was obtainted flask were removed and allowed to cool.

3.5.2.2 Distillation:

The digested sample was poured in volumetric flask (100) and diluted to 100ml with distilled water five millititers were distilled using 10ml of 40% Na OH.

The distillate was received in a conical flask (100ml) containting 25 ml of 2% boric acid plus 3 drops of Indicater (bromcresol green +phenolphthalein red).the value in the in flask was continued until the value in the flask was 75 ml. Then the distillation was removed from the distillatory.

3.5.2.3 Titration:

The distillate titrated with 0.1N HCl until the end point (red colour) and protein percentage was calculated from the following equation Nitrogen % = T x0.1 ×20×0.14×100×wProtein %=N%×6.38

Where T= titration figure

W= weight of the original sample

0.1N = Normaltiy of Hcl

0.14 = the atomic weight of the Nitrogen/100

200 = Dilution factor

3.6.3 . Titratable acidity:

Titratable acidity was determined according to AOAC (1990). Ten ml of yoghurt sample were placed into a beaker and one ml of phenolphtlhalein indicator was added the sample the sample was titrated against 0.1N NAOH till a faint color lasted for at least 30 seconds then the titratable acidity of each sample was calculated as follows:

Titratable acidity = T/w

Where:

T = Titration figures

W = weight of samples

3.7. 4 Total solids content (T.S):

The total solids content was determined according to the modified method of AOAC (1990).

Three grams of sample were weighted into a dry oven flat bottomed aluinmum dish and heated steam bath for 10 -15 minute the was placed in oven at 105 ºc, over night and then cooled in desiccators and weighed quickly were repeated and the difference between the two reading was < 0.1mg. The solids content was calculated from the following equation:

T. s% = W1/W0×100

Where =w1=weight of sample after drying

W0= weight of sample before drying

3.8. 5 Ash content:

The ash content was determined according to AOAC (1990) five gram of the sample were weighted into a suitable crucible and evaporated of dryness on steam bath .the placed in Amuffeurance at 550 −600 until ashes were cooled in adesicator and weighted the ash content was calculated at form the following equation .

Ash % = w1/ w×100

Where = w1 weight of ash

W = weight of sample

3 .9 Sensory evaluations:

Sensory profiling of the recombined yoghurt sample was conducted using conventional profiling by untrained panelists according to Larmond (1977) ten panelists were selected Staff and students of the college of animal production science and Technology, Sudan University of Science and Technology .

The panelists were given ahedonic Questionnair to evaluate taste texure , color ,and Flavor and ore acceptability of coded samples of cow milk yoghurt .

3.10 Data Calculation:

Data were calculated using means average.

CHAPTER FOUR

4. Results and Discussion:

Table (1) and figure (1) showed the chemical composition of reconstituted yoghurt, it showed that total solids were 19.51%, ash was 0.80 %, protein was 5.8 % and acidity was 1.94%.

The results were in disagreement with the result of Dissanayake (2014) this may be attribute to the different procedures and conditions of drying.

Table (2) showed the sensory evaluation of the reconstituted yoghurt were acceptable (5) for color, flavor and taste, while the texture was less cohesive (see appendix).

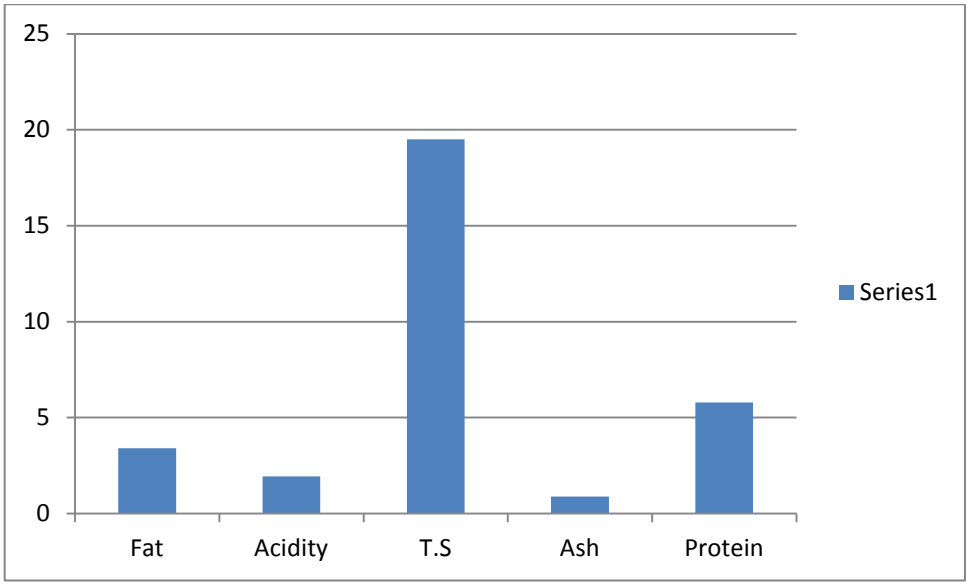

Figure (1): Chemical composition of the reconstituted yoghurt:

Table (1) Chemical composition of the reconstituted yoghurt:

Item	**Fat (%)**	**Acidity (%)**	**T.S (%)**	**Ash (%)**	**Protein (%)**
Average	3.4	1.94	19.51	.0.896	5.8

Table (2): showed Sensory evaluation of the reconstituted yoghurt.

Item	Texture	Flavor	Color	Taste
Score No.	3	5	5	5

(See appendix)

CHAPTER FIVE

5. Conclusion and recommendations

5.1. Conclusion:

- To reconstitute yoghurt form dried yoghurt, the ratio 1:3.5 gm of dried yoghurt to water, respectively, can be used.
- The chemical composition of reconstituted yoghurt were protein 5.8, fat 3.4, acidity 1.94, total solid 19.51, Ash 0.89 (%).
- The sensory evaluation of the reconstituted yoghurt showed acceptable scores.

5.2. Recommendation:

- Reconstituted yoghurt from dried yoghurt can be applicable in rural areas where no facilities and electricity for storing fresh yoghurt.
- Microbial analysis of reconstituted yoghurt should be studied.
- Vitamins and minerals contents of reconstituted yoghurt can be analysis.

References:

Adams, M.R and NOUT, (2008). Fermentation and food safety, Springer India Pvt Ltd ,New Delhi :290

Adams, M.R (1999) Safety of Industrial lactic acid bacteria. J Biotech Springer India Pvt Ltd ,New Delhi 63:17-78.

AOAC (1990). Official Methods of A naylsis. Association of Official Analytical chemists(15ed) .Washington , DC, USA.

AOAC (2003). Official Methods Analytical Chemists Washington ,D-C, USA AOAC (1995) Association of Official Analytical Chemists Methods of Analysis Washington DC- USA.

Batish, V.K; Grover, S; Pattaik, P and Ahmed, N (1999). Fermented Milk product, In Biotechnology :food fermentation (Microbiology , Biochemistry and technology) Vol II: Applied Joshi VK, Pandey A(eds) Eductational publishers and Distributers, Kerala :781-864

Bradley, R.L.J; Arnold; E.J.R; Barbano, D.M; Semerad, R.G; Smith, D.E .and Viriese, B.K (1995). Chemical and physical methods In Marshall, public Health Association Washington Dc-USA.

Caplice, E and Fiterald, G.F (1999). Food fermentation role of microorganisms in food production and preservation Intl food Microbial 50: 131-149.

Caric M. (1994). Concentrated and Dried Dairy product. VCH publisher, New York .

O' Brien, N.M.O and O'Connor, T.P (2004). Nutritional aspects of cheese. In: cheese: General aspects volume 1 .Fox PF(ed) Academic Press, :573-582 .

Crofstey, G; Larsen, G and Olsen, S (2004). Protein powder composition, world patent Application, 08649/WO-AI.

De verse .M, Stegel mann, A; Richer, B; Fenselay, S, L; chrezeumier, C, S (2001). Prebiotics Inefficiency. .A M J Clin Nutr, 73:21-54.

Fames, S.M; Famnnin, S.L; Agee, B.A; Hall, B; Parker, E; Vogt, J; Run, G; Williams; L, L; Salninen, C; Preerndergast , T; Werner, S.B and Chin, J .I (1985). Listeriosis outbreak associated with Mith Mexican style cheese In Califorina . Morbid Mortal weekly Rep 34:357-359.

Kumar, P and Mishra, H.N (2004). Yoghurt powder Review of procces Technology storage and utilization. International Journal of Food and bio products processing volume 82 (2): 133-142.

Gandhi, D.N. (2000). Fermented Dairy Products and their Role in Controlling Food Brone Diseases" In: S. S. Marwaha and J. K. Arora, Eds., Food Processing: Biotechnological Applications, Asiatech Publishers Inc., New Delhi. : 209-220.

Faye, B. and Konuspayeva, G . (2012). The sustainability challenges to the dairy sector– The growing importance of non-cattle milk production worldwide. International Dairy Journal, 24 (2): 50-56.

Gilliland, S.E (1996). Special additional cultures .In Dairy starter culture. Cogan.TM Accolas JP (eds) VCH publishers .New York: 344.

Hati, S; Mandal, S and Kumar ,B.K (2015). Dairy product Technology. Recent Advances fermented Dairy products, New Delhi.

Heller K.J, Bockel mann W; Shrezenmeir, J and deVrese, M (2008). Cheese and its potential as a probiotic Food. In: Handbook of Fermented Functional Foods, farnworth ER (ed).CRC press, Tylor and Francis Group, Boca Raton :243-266.

Heme, T and Otte, J.(2010). Status and prospects for small holder milk production: A global Perspective (PDF). Food and Agriculture Organization of the United Nations.

Kemp, N (1984) .KeFir the chempasne of cultured dairy product cultured. Dairy prod J: 29-30.

Kosikowski, F (1977). Cheese and fermented milk foods. 2nd ed . Edward Brothers Inc.USA.

Larmond, E. (1977). Laboratory Methods for Sensory Evaluation of Foods . 1st Edn , Department of Agriculture Publication, Otawa, Canada, ISBN-13: 978-0662012719, : 1637.

Marteau, P and Rombaud , J.C (1996). Therapeutic application of probiotics in humans .In Gut Flora and health .past ,present and Future Leeds AR, , Rowlnand IR (eds) .

Owen, E., Kitalyi , A., Jayasuriya , N and Smith, T. (2005). Livestock and wealth creation : improving the husbandry of animals kept by resource-poor people in developing countries. Nottingham, Nottingham University Press.

Oyetayo, V.O; Oyetayo, F.L (2005). potential of preobioctics biotherapeutic agent targeting the in nate immunes system Afircan Biotechnol, 4 :123-127

Pehrsson ; P. R ;Haytowitz; D .B; Holden, J.M; Perry, C.R and Beckler D.G.(2000)."USDAs National Food and Nutrient Analysis Program: Food Sampling "(PDF).Journal of Food Composition and Analysis, 13(4):379-389.

Ramirez, F; Salogado, E ; Cervantes ,M.A; Rodriguez ,G.C and Garcia ,H.S (2002). Addition of hydrocolloids to improve the Functionality of spray dried yoghurt. .Milchwissens haft :57, 87-89.

Robinson, R; K Tamime A. Y and Wszolek , M-(2002) Microbiology of fermented Milk –Dairy Microbiology Hand book (ed-R. K-Robinson) 3rd edn , John wiely and Sons , New York:367−490 .

Sanders ,M.E .(2012). Probiotics for Healthy consumer . Functional food Reivew , 4(4) 144-151.

Shah, N.P.(2000). Effects of milk- derived bioactive: an overview. British Journal of Nutrition , 84 (suppl.1) 3-10.

Smit ,G (2005). Dairy processing improving quality, milk Combridge: Wood hood Pulsihing Ltd ISBN 1855736764

Staff, M.C (1998). Cultured Milk and Fresh Cheeses .In The Technology of Dairy products.2nd Ed., R. Early ed, Blackie Academic and Professional , London :123-157.

Tammie, A (2006) Fermented milks dried yoghurt. Consultant Ayr, UK Publishing Company Editorial office: Blackwell Science Ltd 96oo Garsington Road Oxford Ox4 2DQ, UK Tel +44 : 229.

Yadav H; Jain,S and Sinha,P.R (2007) Production of free fatty acids and conjugated linoleic acids and Probiotic *dahi* containing *Lactobacillus acidophilus* and *lactobacillus casei* during fermentation and storage. Inrl Dairy J, 17:1006-1010.

Topisirovic,L; Kojic, M; Fira, D; Golic ,N; Strahinic, I and Lozo,J (2006). Potential of lactic acid bacteria isolated from specific natural niches in food production and preservation .Intl J Food Microbiol .USDA1978.Cheese varieties and descriptions USDA, Washington,:1-140.

Appendix

Sensory evaluation sheet:

Sample No.	Color	Taste	Flavor	Texure

Keys:

Color	Very Acceptable (7)	Acceptable (5)	less acceptable (3)	Unacceptable (1)
Taste	Very palatable (7)	Palatable (5)	Less palatable (3)	Un palatable (1)
Flavor	Very acceptable (7)	Acceptable(5)	Less acceptable (3)	Un acceptable(1)
Texture	Very Cohesive(7)	Cohesive (5)	Less Cohesive (3)	Un cohesive (1)