

Importance and Technology of producing Set Yoghurt and Cheeses from Goat milk: short communication

Corresponding author: Kayo Garamu, Milk and Milk Product Research Processing Industry
Development, Livestock Development Institute (LDI Bishoftu Center), P.O.Box: 1573,
Bishoftu, Ethiopia

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Bishoftu, Ethiopia

April, 2022

Abstract

Goats are important milk producers in several parts of the tropics and contribute significantly to human nutrition in many developing countries and can be called as Poor man's cow. The goat fresh milk which is obtained under good handling conditions from properly fed and managed healthy goats is free from objectionable flavor and odor. In the tropical country where a large number of goats' production is found and their milk is consumed directly without any heat treatment. To overcome the problem of processing technology and providing the awareness, this review contributes a great contribution. The indigenous Adal breed's raw goat milk was collected from the Afar region, around Awash seven town rural areas. From 60 liters of collected goat milk, 20 liters for set yoghurt, 20 liters for provolone and 20 liters for mozzarella were brought to the laboratory. Before processing, some parameters were used to check the freshness of the goat milk, like pH, temperature, and alcohol test. The processing of the goat milk into set yoghurt, mozzarella, and provolone cheeses was carried out in the Addis Kidan Milk Processing Industry and Ethiopian Meat and Dairy Industry Development Institute Dairy Laboratory by using the same procedure as cow's milk processing for these products.

Keywords: - Goat milk; set yoghurt; mozzarella, provolone, cheese

Introduction

Due to rapidly increasing human population, the demand for milk and milk products is on the rise in the tropical developing countries. According to Devendra and Mc Leroy (1982), the increased demand of milk and milk products can be met by increasing ruminant livestock population. With help of strategy can enhance the contribution of small ruminants in general and goats in particular in meeting this demand will be very high. Goats are important milk producers in several parts of the tropics and contribute significantly to human nutrition in many developing countries (Devendra, 1999). According to (Iqbal et al., 2008), Goat can be called universally as Poor man's cow or lower income generating people's cow.

The goat fresh milk which obtained under good handling conditions from properly fed and managed healthy goats is free from objectionable flavor and odor. The nutritional composition and characteristics of Goat's milk high proportion of butter fat gives goat milk a greater energy value per unit volume than cow's milk. The lactose content of goat's milk is slightly lower than cow's milk. Since some people have difficulty for digesting the lactose in milk, goat milk is less likely to cause this problem than cow's milk. This makes goat's milk preferable by consumers having such digestion problems. For yogurt making, the low lactose of goat milk gives a less acidic and more palatable product than cow's milk with no need for fruit or flavoring. This means it can reduce cost of production of yoghurt which added to attract consumers according to their behavior.

There is no much significant difference in cow's milk and goat's milk protein composition. But, the physical characteristics of the curd that these proteins formed under the action of rennin (the principal enzyme secreted by the newborn stomach) is significant. That means the softer the curd; the more easily it is digested. The curd of cow's milk is harder than the curd of goat's milk. Size also has something to do with its digestibility and the curd of cow's milk is large and dissolves more slowly. The finer curd of goat's milk dissolves more rapidly. This means that for some people with digestive difficulties, goat's milk may be more easily digested.

Goat's milk contains more calcium, phosphorus, chlorine, magnesium, and potassium than cow's milk or human milk. The amount of phosphorus in goat's milk helps people living on a diet of root plants, fruits, and green vegetables.

For the adult milk-drinkers, goat's milk provides twice the Vitamin A obtained from cow's milk. Vitamin B is concerned with nervous control. The human need of this vitamin is thought to increase

with the intake of sugar and other carbohydrates; there is some evidence also that it plays a part in protein digestion and metabolism.

Goat's milk is 50 percent richer in Vitamin B than cow's milk than and four times as rich as human milk and very high in riboflavin (Vitamin B2), which affects growth. Vitamin C and D are not present sufficiently in either cow's milk or goat's milk, and any child that is bottle-fed will need supplements (The Dairy Goat Manual 158 4-H Publication).

The importance Goat cheese, like goat milk, is easier on the human digestive system and lower in calories, cholesterol and fat than its bovine counterpart. In addition, goat milk cheese is rich in calcium, protein, vitamin A, vitamin K, phosphorus, niacin and thiamin. The fats found in goat milk products are high in middle chain fatty acids, which are easier for the body to process than those found in cow's milk.

Goat milk yogurt is one of the fermented dairy foods. Fermented goat milk products play a significant role in securing food for rural communities of many developing countries. There is a target market of goat yogurt for individuals who look for the special taste or health benefits, which are allergic to cow milk protein, specifically α 1-casein. Some individuals who simply enjoy the flavor of goat milk products, in fact many gourmet food consumers are willing to pay high prices for certain goat milk products. In addition, certain consumers believe that goat milk is nutritionally superior to bovine milk. This belief certainly creates a larger market. Fermentation diminishes the "goaty" flavor, which is often perceived as distasteful in the market. This taste is attributed to the aroma compounds and acids produced by the yogurt starter cultures during fermentation. Goat milk yogurt can be made in a similar manner to the cow counterpart. One of the main problems in manufacture of goat milk yogurt is weak and lack of consistency in curd tension or viscosity upon agitation compared with cow yogurt. This is due to the difference in protein composition between the goat and cow milks, especially in casein contents (Park, Y.W. and M. R. Guo. 2006).

Ethiopia is one of the countries found in tropical area and large small ruminant numbers like goats are found in the countries regions in such Afar, Oromia, Ethio-Somale and in some parties of others regions in pastoral and agro pastoral areas. In these areas the people use goat's raw milk as human nutrition beside of their meat and skin.

Importance of goat milk

The importance of goats as providers of essential food in dairy products has been well recognized around the world. This importance is also reflected in the largest goat animal number increase during the last 20 years which led to largest goat milk production compared to other mammalian farm animals (FAO, 2001). The demand for goat milk is increasing because of the growing populations of people, increasing levels of disposable incomes and the connoisseur interest in goat milk products especially cheeses and yoghurt in many developed and developing countries. The demand is also growing because of a wider awareness of problems with traditional medical treatments to such afflictions, especially in developed countries.

Basic composition of the goat milk is very similar to bovine milk however exact composition varies with many factors verses breed, individual, diet and feeding, lactation period, health statues etc. A high level of variability in biochemical composition, physico-chemical characteristics and bacteriological quality properties of goat milks have been reported and hence gains significance in nutritional and technological parameters of goat milk dairy products (Raja, 2014).

Gross Compositions of Goats milk

The average composition of goat milk does differ from the composition of cow milk and human milk in the contents of total solids, protein, fat, and lactose, ash and moisture content as shown in the table below.

Table1. Average composition of goat milk

Species	Moisture	Fat	Protein	Lactose Ash	Lactose Ash	Solids not fat	Total solids
Goat milk	87.00	4.25	3.52	4.27	0.86	8.75	13.00
Cow milk	87.20	3.70	3.50	4.90	0.70	9.10	12.80
Human milk	87.43	3.75	1.63	6.98	0.21	8.82	12.75

Source: - Compositional and physio- chemical attributes of yoghurt prepared by using caprine milks (Raja, 2014).

Physico -chemical properties of goat milks

Specific gravity

Specific gravity of milk samples was found in range of 1.027-1.031 Kg/m⁻³ for cow milk and 1.028 - 1.032 Kg/m⁻³ for goat milk. The specific gravity of cow and goat milk is almost similar and generally found in the range of 1.023 to 1.030 Kg/m⁻³. The specific gravity of milk depends upon

the concentration of the individual components, the degree of hydration of proteins, physical state of fat and temperature system of the sample (Raja, 2014).

Surface tension

The fat and proteins mainly contribute to the surface tension of milk Surface tension of goat milk is 52.0 dynes/cm which is almost similar to bovine milk 42.3–52.1 dynes/cm (Raja, 2014).

Freezing point

The freezing point for goat milk ranges between -0.540 and -0.570°C, while the bovine milk usually is ranges in between -0.512 to -0.550°C. The milk of animals has freezing point much lower and amounted to -0.609°C, -0.596°C and -0.625°C for three subsequent lactation stages, respectively (Raja, 2014). Such low values for the freezing point may be related to the fact that the concentration of individual milk components increased with the progress of lactation. The freezing point of the milk is governed by the concentrations of solutes in solution particularly lactose and milk salts (Sherbon, 1988).

Rennet coagulation time

Clotting by rennet is a complex phenomenon both primary and secondary phase of clotting depend on various factors concentration of rennet, temperature, homogenization, species, breed, fat content, fat globule size, composition of fat globule membrane, ionic calcium content etc (Raja, 2014).

Nutritional and Health benefits of goat milk

Goat is one of the main contributors of dairy and meat products for rural people, more than any other mammalian farm animal, particularly in developing country. In addition to that, another important aspect of demand for goat milk derives from the affliction of persons with cow milk allergies and other gastro-intestinal ailments. Goat milk differs from cow or human milk in having better digestibility, alkalinity, buffering capacity and certain therapeutic values in medicine and human nutrition (Raja, 2014).

Average amino acid composition of goat and cow milk shows higher levels of 6 of the 10 essential amino acids Threonine, Isoleucine, lysine, cystine, tyrosine, valine in goat milk (Raja, 2014).

Capric, caprylic acids and medium chain triglycerides (MCT) have become established medical treatments for an array of clinical disorders, including malabsorption syndromes, chyluria,

steatorrhea, hyperlipo-proteinemia, intestinal resection, premature infant feeding, non-thriftiness of children, infant malnutrition, epilepsy, cystic fibrosis, coronary by-pass, and gallstones, because of their unique metabolic ability to provide direct energy instead of being deposited in adipose tissues, and because of their actions of lowering serum cholesterol, inhibiting and limiting cholesterol deposition. Goat milk has higher content of monounsaturated (MUFA), polyunsaturated fatty acids (PUFA), and medium chain triglycerides (MCT) than cow milk, which all are proven to be beneficial for human health, especially for cardiovascular conditions (Raja, 2014).

Oligosaccharides content of goat milk is more than cow milk which acts as a prebiotic nature which acts as a feed supplement to the intestinal micro flora. The children on goat milk surpassed those on cow milk in weight gain, height, skeletal mineralization, and blood serum contents of Vitamin A, calcium, thiamine, riboflavin, niacin and hemoglobin. The feeding of goat milk instead of cow milk as part of the diet resulted in significantly higher digestibility and absorption of iron and copper, thus preventing anemia. Goat milk supplies adequate amounts of vitamin-A and niacin, and excesses of thiamine, riboflavin and pantothenate for a human infant (Raja, 2014).

Manufacturing procedures of goat milk set yogurt

The basic processing procedures of goat milk yogurt include: (A) Preparation of milk, (B) Pasteurization 90°C for 10 min (vat), (C) Cool the pasteurized milk to 116°F (45°C), (D) Inoculation 2% thermophillic starter culture (E) Packaging (set yogurt), (F) Incubation (Permit filled Cups to remain in room at 114°F (45°C) for 3-4 hours or until a firm, smooth gel has formed to pH 4.6), (G) cooling to 1-4°C (Store the yogurt at 40°F (below 7°C)).

Making mozzarella cheese from goat milk

The same to cow's milk, mozzarella cheese making from goat milk is described as the following detailed protocol: Measuring liters of raw milk and pasteurize the milk at 63°C for 30 min. in vat. Cooling to 36°C and add thermophillic starter culture and stir gently, add rennet into the milk then stir gently. Leave undisturbed for 20 to 30 minutes, cut the curd into finger size pieces with steel knife, Stir to float curd and then leave to settle, draining whey off 2/3rd, collect the curd in large pieces on a rack in the vat for 2:30- 3:00 hours until the curd reaches pH 5.2. Soak strips of the curd in hot water, 80-90°C to test the curd for stretching (strip should pull out to about 1 meter long). Allow the curds to stretch out in single layers on the bottom of the vat. Then cut into strips through mechanical mill. Put a quantity of milled strips into hemispherical vat with hot water 80°C. Leave to heat up and then stretch the curds (manually or with paddles) repeatedly until smooth curd is developed. Knead the curd into shape by hand or fill and press into the mould like ball. Immerse the cheese in cold water for 40 minutes then in brine solution. Pack and store at 4°C.

Provolone cheese from goat milk

The same to cow's milk, provolone cheese making from goat milk is described as the following detailed protocol: Measuring liters of raw milk pasteurize the milk at 63°C for 30 minutes in vat , Add 2% thermophilic starter culture and stir gently, add rennet powder into the milk then stir gently. Leave undisturbed for 20 minutes to 30 minutes, cut the curd into finger size pieces with steel knife and Stir to float curd and then leave to settle, draining whey off 2/3rd, collect the curd in large pieces on a rack in the vat for 2:30- 3:00 hours until the curd reaches pH 5.1. Soak strips of the curd in hot water, 80-90°C to test the curd for stretching (strip should pull out to about 1 meter long) if no PH meter. Allow the curds to stretch out in single layers on the bottom of the vat. Then cut into strips through mechanical mill. Put a quantity of milled strips into hemispherical vat with hot water 80°C, leave to heat up and then stretch the curds (manually or with paddles) repeatedly until a shine on the smooth plastic body of the curd is developed. Knead the curd into shape by hand or fill and press into the cylindrical mold, put the cheese in cool water for more than 1 hour and immerse the cheese in 18-23% salt brine for about 6 hrs according to size. Hang the cheese in a rope net to dry at room temperature for 3 days. Cover the surface of the cheese by wax for safety.

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Picture1.



picture2.

Picture 1 and 2 shows that when provolone and mozzarella cheeses processed at Addis kidan milk processing company

Recommendation

- All characteristics of physic- chemical and biological analysis should be conducted on goat milk products and by products.
- The rest products of goat milk characters those do not considered in this paper should be identified
- The local and scientifically methods of processing goat milk into different products should be identified.
- Researchers should be put finding on the improvement of technology of processing goat milk especially for tropical countries and agro pastoralist areas.

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