Composition, Nutritive and Medicinal Value of Goat Milk in the Tropics

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Abstract: Small ruminants are important component of livestock industry having adaptability to harsh climates which make them suitable for landless and marginal farmer’s specifically Goats. The contribution of goats in supplying milk and milk products is high and it has significant role in rural economy and health human especially who have problem of lactose intolerance and sensitive to other animals’ milk. Goat rank third in terms of global milk production from different species. Goat milk is composed of different usable nutrients which are important to their young and humans. Among those important nutrients that are found in goat milk are fat, protein, lactose, vitamins, enzymes and mineral salts. Goat milk contains higher amount of calcium, magnesium and phosphors than cow and human milk. Medium chain triglycerides (MCT) and proteins which are more in goat milk have been recognized as unique lipid and protein with unique health benefits. The soft curd of goat milk may be an advantage for adult humans suffering from gastrointestinal disturbances and ulcers. Goat milk is important for prevention of cardiovascular disease, cancer, allergy and microorganism and used for stimulation of immunity. Goat milk is recommended for infants, old and convalescent people. For instance, goat’s milk contains 25% more vitamin B6, 47% more vitamin A and 13% more calcium than cow’s milk. However, available information concerning goat milk is mainly limited to data on its gross composition, and information on the nutritional quality of goat milk, especially important nutritional constituents are scarce. In addition, cultural beliefs challenge the reputation of the advantage of goat milk consumption and the development of the sector, especially in developing countries. Knowledge about the nature of goat milk is important to investigate the use of the goat milk to humans. Moreover, goat milk is also used as therapy against different problems including gastrointestinal disturbances, vomiting, colic, diarrhea, constipation and respiratory problems. The consumer acceptance of goat milk and its products is reported to be excellent. Despite this fact, goat has remained neglected in research and development.

Keywords: Goat; Milk Composition; Medicinal Values; Nutritional Values

1. INTRODUCTION

There are nearly 500 breeds of goats in the world; however, only a half dozen are generally raised for their milk purpose and about 600-700 million of dairy goats are present in the world (Ensminger, M.E. and R.O. Parker, 1986). They are living in climates ranging from high altitude mountains to deserts...
FAOSTAT, 2008. More than 95% of the goat population is found in developing countries. Worldwide trends of the evolution of the goat population and their products between 1969 and 2010 show a continuous and rapid increase relative to either cattle or sheep, especially in the developing countries (Haenlein, G.F.W., 2004). In Ethiopia goats are raised mainly for three purposes; about 3% of adult goats are kept for milk, about 3.36% for meat, about 46.3% for breeding, and the rest are raised for all the above three and other purposes (Park, Y.W., 2007).

According to CSA (2008-2010), there are about 21.96 million goats in Ethiopia. Due to rapidly increasing human population, the demand for milk and milk products is on the rise in the tropical developing countries. The increased demand can be met by increasing ruminant livestock population as suggested by (Brule et al, 1982). 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 (Kitts, D.D. and K.A. Weiler, 2003). Goats produce only about 2% of the world's total annual milk supply (FAO, 1998). However, their global contribution to the nutritional and economic well-being of humanity is tremendous. Worldwide, more people drink the milk of goats than the milk of any other single species. Goat milk has advantages over cow or human milk in having higher digestibility of protein and fat, alkalinity, buffering capacity, and certain therapeutic values in medicine and human nutrition.

The basic Composition of Goat milk is similar to cow milk in its basic composition. Caprine milk, on the average, contains 12.2% total solids, consisting of 3.8% fat, 3.5% protein, 4.1% lactose, and 0.8% ash. It has more fat, protein, and ash and less lactose than cow milk. Goat milk contains slightly less total casein, but higher non-protein nitrogen than the cow counterpart. Goat milk and cow milk have 3 to 4 times greater levels of protein and ash than human milk. Total solids and caloric values of goat, cow, and human milks are similar (Haenlein et al, 1984, Jenness, R.1980 and Chandan et al, 1992). One of the most important contributions of goat milk to human nutrition is the calcium and phosphate that it supplies. Goat milk contains about 1.2 g calcium and 1 g phosphate per litre; these concentrations are similar to those in cow milk (Cerbulis et al, 1982). Human milk contains much less of these minerals with only one-fourth as much calcium and one-sixth as much phosphate. The soft curd of goat milk may be an advantage for adult humans suffering from gastrointestinal disturbances and ulcers (Loez-aliaga et al, 2010). High buffering capacity of goat milk appears to be useful for treatment of gastric ulcers (Cebellos et al, 2009). Goat milk has been recommended as a substitute for patients allergic to cow milk. Between 40-100% of patients allergic to cow milk proteins tolerate goat milk (Cebellos et al, 2009). Farmers and pastoralists all over Africa are increasingly turning to goats as a means of survival and a way of boosting their incomes (Peacock 2005). Most importantly their products such as meat are not subjected to any religious taboos unlike the pork and beef to Muslims and Hindus, respectively (Chenyambuga et al, 2012). There is also a growing awareness of the importance of goat as a source of milk off-take for home consumption (Tona et al 2015) and they are normally called the 'poor man’s cow’ (Lemma et al, 2003). Goat’s milk is better as compared to cow’s milk for people suffering from lactose intolerance, which is a common phenomenon among adults in Sub Saharan Africa (Haenlein, 2004). Besides to its better digestibility, goat’s milk contains almost same amount of lactose as cow’s milk (Silanikove et al, 2015) with high quality proteins and a great content of minerals and vitamins (Brito et al, 2011).

Goat population of Ethiopia ranks high both in the Africa continent and the globe in general (FAOSTAT 2014). In fact, Ethiopian goats are among the neglected animal genetic resources in agricultural research centers and development of breeding programs except limited experiences of FARM Africa, the Boer goat breeding program of Ethiopian Sheep and Goat Productivity Improvement Program and recently BecA-ILRI Hub. Hence, it seems rationale to investigate milk production potential elaborately in indigenous Ethiopian goats resulting in better productivity, which will contribute in the reduction of poverty in the country. In many tropical countries, goats are important especially to the livelihood of the poor in rural areas. This is due mainly to their efficiency in terms of meat and milk production, low cost of maintenance, a great adaptive feature to the tropical harsh environment and their inherent suitability for small-scale production (Silanikove, 2000; Misra and Singh, 2002; Degen, 2007). In Ethiopia, where milk
makes an important part of the diet and also contributes to the household income for livestock keepers, local goats are very important livestock species. Generally, the majority of smallholder farmers in rural Ethiopia are resource poor and therefore do not afford buying cattle and accordingly producing meat and/or milk, or even the products per se on a regular basis.

There are various factors that affect the content of the goat’s milk. These factors are including breed, stage of lactation, season of kidding, species, individual animals, age and parity, colostrums, feed (diet), environment (temperature and humidity, length of dry period and gestation, disease and body weight (Diaz-Castro et al, 2010). Even though numerous review has been carried out in different milking animals in the world, the importance and use of goat milk is not reviewed which created scarcity of information in the area. Therefore the objectives of this seminar paper were to review available information on the nutritional and medicinal values of goat milk and to recommend further investigation concerning nutritional and medicinal value of goat milk.

Therefore, this paper was embodied with the following objectives:

✓ To review the milk composition of goat.
✓ To review the nutritive and medicinal value of goat milk
✓ To review and explain the potential influencing factors on goat milk production and composition

2. LITERATURE REVIEW
2.1. NUTRITIVE VALUE OF GOAT MILK

Children with problems digesting cow’s milk may have a viable alternative in raw goat’s milk which is the second best food option, first being mother’s milk, that can consume comfortably, even if they are sensitive to cow or other animals milk. In fact, goat’s milk is very similar to human milk, children who drink goat’s milk tend to remain more satisfied between meals and sleep through the night (Park YW, 2006a). Beyond meeting daily nutrient requirements, it is of special interest that goat milk has unique properties, which distinguish from cow’s milk and make them a valuable alternative not just for infants, but also for adults and especially nursing mothers (Razafindrakoto et al, 1994).

The milk contains vitamins, minerals, electrolytes, trace elements, enzymes, protein, fatty acids and amino acids (especially tryptophan) that are utilized by human body with ease. Perhaps the greatest benefit of goat’s milk, however, is that some people who cannot tolerate cow’s milk are able to drink goat’s milk without any problems. It is not clear from scientific research studies exactly why some people can better tolerate goat’s milk; perhaps due to lower in lactose content (7% less from cow milk). In fact, our body can digest goat’s milk just in 20 minutes while cow’s milk takes 2-3 hours (Park YW, 2006a). The vitamin and mineral content of goat’s milk and cow’s milk are fairly similar, though goat’s milk contains a bit more calcium, vitamin B6, vitamin A, potassium, niacin, copper and the antioxidant selenium. On the other hand, cow’s milk contains more vitamin B12 and much more folic acid. Since goat’s milk contains less than ten percent of the amount of folic acid contained in cow’s milk, it must be supplemented with folic acid. For this reason, be sure you get a goat’s milk that is supplemented with folic acid, which the best brands usually (Tracet JB, 2001).

2.2. MEDICINAL VALUE OF GOAT MILK

The symptoms like gastrointestinal disturbances, vomiting, colic, diarrhea, constipation and respiratory problems can be eliminated when goat milk is fed to the infants. Pasteurized goat milk is well tolerated by the infants with gastro intestinal or respiratory symptoms. Fermented milk forms a soft curd when compared to cow’s milk and hence helps in easy digestion and absorption. Regular intake of goat milk significantly improves the body weight gain, improved mineralization of skeleton, increased blood serum vitamin, mineral and hemoglobin levels (Margan D et al, 2012).
2.2.1. Antimicrobial Properties

Redundancy failures in antibiotic treatment to emerging diseases caused by bacteria and viruses has led to the rise of studies, researches and development of antimicrobial from natural products includes plants derived source and the most sought after in these two decades were pro-biotic and pre-biotic products from the lactic acid bacteria. Extensive work has been carried out on bacteriocin like inhibitory substance Mallesha et al, 2010 and also on the producing strains of lactic acid bacteria (LAB) for potential use as bio-preservatives (Omumu, A.M. and O.W. Faniran, 2011). Milk proteins have also been proved to be precursors for antimicrobial peptides. The most well known peptides are those derived from lactoferrin. Lactoferrin is an iron-bind which main function is iron transport (Garcia-Montoya et al, 2011).

2.2.2. Treatment of Cardiovascular Diseases

Cardiovascular disease (CVD) is the most common cause of death in industrialized countries. It includes many diseases that involve heart and blood vessels; coronary heart disease, high blood pressure, arrhythmias and atherosclerosis. The main cause of CVD is atherosclerotic plaque development in blood vessels that eventually leads to cardiovascular incident. The risk factors influencing atherosclerosis are lifestyle (Smoking, diet and exercise), high blood pressure, dyslipidemia, diabetes and obesity (Lindqvist, H, 2008).

2.2.3. Treatment of Gastrointestinal Diseases

Inflammatory bowel disease (IBD) comprises two different but closely related conditions, ulcerative colitis and Crohn’s disease. The hallmark of IBD is chronic and relapsing inflamation of the intestine, but there are important differences from Crohn’s disease with regard to patho-physiology and treatments ( Lindqvist, H, 2008).

2.2.4. Treatment of Cancer, Allergy and Others

The most common antigens in foods are proteins. Milk is considered one of the most common food allergens and is the most common sensivity in young infants, with a 2-6% incidence (Lara Villoslada et al, 2006). Allergies can be acute or chronic in nature, their symptoms ranging in severity from non-life threatening reasons such as eczema, rhinitis and digestive problems to very serious life threatening reasons including anaphylaxis, bronchospasm and urcaria (Mc Cullough, F., 2003). Numerous studies and anecdotal evidence suggest that goat milk is a much less allergic alternative to cow milk due to its differing protein structure, namely its casein micelle components (Park et al, 2011). Goat milk has demonstrated significant improvements in colic, minor digestive disorders, asthma and eczema over cow milk, as well as in infants and children with cow milk sensitizes [3, 65] indicated that treatment with goat milk typically resolves between 30 and 40% of problem cases of childhood cow milk allergy, which can be higher in some cases (One study showed improvements in 49 out of 55 children treated with goat milk) (Russel D et al, 2011).

2.2.5. Immunological Properties

Many types of cells are involved in the innate and adaptive immune response, with T- lymphocytes (T-cells), Natural Killer (NK) cells and B-lymphocytes (B-cells) as the main players (Shea O et al, 2004).

3. CONCLUSION AND RECOMMENDATIONS

Recently, goat milk consumption and production increases globally as people recognize the advantage of goat milk especially in the developed nations. Goat milk products are also considered to be the dairy products with greatest marketing potential. It is well known that goat milk has high nutritional value and composition than other species of animals, where there is adequate browse and water supply and they are mainly raised in rangelands in semi deserts and sub tropic conditions. Goat has the ability to produce milk of good composition and quality for human consumption. These compositions of milk are fat, protein, ash, vitamins, lactose and enzymes. Generally, the unique characteristics of goat milk have
been fairly good surveyed concerning nutritional value and health effects. The superior digestibility of goat milk, the proper composition of fatty acids, protein and its content of bioactive compounds seem to give properties suitable for treating or preventing certain medical conditions. Goat milk has beneficial effects on mal-absorption disorders and inflammatory bowel diseases.

Moreover, it also has medicinal value for human being and is healthy alternative to cow’s milk that may be more easily digested than regular cow’s milk, especially to children and those who have sensitive stomachs to other animals’ milk. Goat milk lacks folic acid and it does not recommend for infants under one year because it can cause anemia. Goat milk also has a higher renal solute load compared to cow’s milk and can place stress on an infant’s kidneys. This milk has been found to cause metabolic acidosis and intestinal irritation when fed to infants in the first month of life.

From the above conclusion the following recommendations were promoted:

- It is very important to be aware Peoples about the nutritional value and health benefits of consuming goat milk.
- The Research Center and government should participate in the animal and human health care, and developing the dairy goat production since it very important to improve the health of the population
- Studies should be conducted on role of goat milk and performance of milk production in dairy goat producer area.

4. REFERENCES
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