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Pulse of Livestock Industry

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Chemico-Medicinal Significance of Goat Milk

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The importance of goat rearing in providing nutritional and financial security to the economically weaker sections of the society is well recognized in developing countries. Goats are known for their versatility in adapting to arid, humid, tropical, cold, desert and mountain conditions and in the process providing people with many important livelihood products such as meat, milk, skin, pack power, mohair and enriching manure for crops and gardens. Goat milk production is a dynamic and growing industry that is fundamental to the wellbeing of hundreds of millions of people worldwide and is an important part of the economy in many countries. Lately India is producing 165.4 MT liters of milk, out of this 3 % production contributed by only goat.



Goat milk (Caprine milk), on an average contains about 12.2% total solids, consisting of 3.8% fat, 3.5% protein, 4.1% lactose, and 0.8% ash. In other words, it has more fat, protein, ash and less lactose than cow milk. The total casein content of goat milk is slightly less but has higher non-protein nitrogen content than that of the cow milk. The most striking difference in the basic composition between goat (or cow) milk and human milk lies in protein and ash contents. Goat and cow milk have substantially (about three to four times) greater levels of protein and ash content than human milk, which is species specific and directly related to growth rate of the newborn of the respective species.

Physio-chemical properties of Goat Milk

The specific gravity of goat and cow milk is almost similar in nature (the specific gravity ranges between 1.028 and 1.030). The viscosity of goat milk is 13.4 mP at 27°C, which is marginally lower than cow milk, but the value of refractive index lies in between that of cow and buffalo milk.

The electrical conductivity of goat milk ranges between 0.0101 and 0.0188 $\text{ohm}^{-1} \text{cm}^{-1}$. The titratable acidity expressed as percentage of lactic acid ranges between 0.11 and 0.18, which is again within the range encountered in cow milk.

The mean pH value of goat milk varies from 6.5 to 6.9 whereas it is 6.6 to 6.8 in case of cow milk. The value of curd tension test of goat milk is well below than that of cow milk. The average value with pepsin calcium chloride is 36. This is responsible for better digestibility in goat milk as compared to cow milk.

Fat profile: The average size of fat globule of goat milk is about 3.5 micrometers as compared to 4.5 micrometers for cow milk fat. Smaller fat globules make a better dispersion and helps in formation of more homogeneous mixture of fat in goat milk. This in turn would provide lipases with a greater surface area of fat for enhanced lipolytic or digestive action. Natural homogenization of goat milk would be better for digestion from a human health standpoint than the mechanically homogenized cow milk products. The smaller physical size of fat globules in goat milk appears to be associated with poor creaming ability, i.e. due to lack of agglutinins in goat milk, the fat globules do not clump together when it is chilled.

Of the total milk fat present in the goat milk, 97-99% exists as of free lipids and 1-3% in bound form. The ratio of bound to free lipids is comparable to that for cow milk. Free lipids of goat milk contained about 97% triglycerides, 2% diglycerides, and 1% monoglycerides, whereas bound lipids contained 46.8% neutral lipids and 53.2% polar lipids (8.5% glycolipids and 44.7% phospholipids). Goat milk fat has high levels of caproic, caprylic, and capric acid with low amounts of butyric acid. The high concentration of short and medium chain fatty acids in the lipid component of goat milk is beneficial to the body. The digestibility of the goat milk fat is comparatively higher when compared to cow milk because lipase attacks ester linkages of short or medium chain fatty acids more easily than those of longer chains.

The fatty acid composition of goat milk reveals the presence of higher concentration of short and medium chain fatty acids, which are thought to be responsible for the characteristic "goaty odour" in goat milk. But, the silver lining is that they are amenable to heat treatment and hence pasteurization of milk removes the defect. Another group of scientists refute this claim and state that the presence of buck during milking of does is responsible for the absorption of the odour produced from the glands of buck.

Proteins quality: There is significant difference between cow and goat milk, with regard to the size of the casein micelle. The casein micelle in cow milk is small (60-80nm) when compared to goat milk casein micelle, which range between 100-200nm. Goat milk proteins form smaller, softer and more friable curds during acidification in the stomach when compared to cow milk and this facilitates the stomach proteases to act on them and digest them more efficiently. The greater buffering capacity of the goat milk makes it as an ideal candidate for the treatment of stomach ulcer. Additionally, goat milk has A2 beta-casein, which is far healthier than A1 beta-casein that contains in exotic cow milk. A2 beta-casein is considered the safer variant of beta-casein, while its A1 counterpart has been found to trigger Type 1 diabetes.

Minerals and Vitamins: The mineral content of goat milk varies from 0.70 to 0.85 %. When compared to human and cow milk, goat milk contains more calcium, phosphorous and potassium. The vitamin content of goat milk is similar to that of cow and human milk.

Medicinal properties of goat milk

The importance of feeding of infants with goat milk has been recognized since ancient days. The milk allergy problem common in infants fed with cow milk is rarely encountered when replaced with goat milk and it plays an important role in the formulation of infant formula. This is a proof of the medicinal property of goat milk.



The symptoms like gastrointestinal disturbances, vomiting, colic, diarrhoea, constipation and respiratory problems can be eliminated when goat milk is fed to the infants. The reason cited for the relief in respiratory problems when fed with goat milk can be attributed to the structure of casein micelle of the goat milk.

Pasteurized goat milk is well tolerated by the infants with gastro intestinal or respiratory symptoms. Fermented goat milk products are ideal for the persons allergic to cow milk. The goat milk is naturally homogenized. It forms a soft curd when compared to cow 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 haemoglobin levels. These points are considered advantageous when compared to consumption of human milk. The high concentration of short and medium chain fatty acids in the lipid component of goat milk is beneficial to the body. The advantages can be three fold as follows. The digestibility of the goat milk fat is comparatively higher when compared to cow milk. Goat milk fatty acids in turn beneficially alter the cholesterol metabolism like hypocholesterolemic action on tissues and blood via inhibition of cholesterol deposition and dissolution of cholesterol in gallstones.

Benefits of Drinking Goat Milk:

- **Strengthen Bones:** Goat milk along with calcium is rich in amino acid tryptophan, further keeping our bones and teeth stronger.

- **Encourage Metabolism:** A single cup of goat milk may provide sufficient amount of calcium, vitamin B, phosphorus and potassium. It is rich in iron and copper that helps in improving your metabolism rate.

- **Stimulate Immune System:** Goat milk is a rich source of selenium which is a key component in boosting the immune system.

- **Anti-Inflammatory Properties:** Goat milk is anti-inflammatory due to the unique enzymatic make-up that helps soothe inflammation in the gut.

- **Augmentation of comprehensive growth:** Goat milk is rich in protein, which contributes to the overall growth and development of the body.

- **Keep heart health optimum:** The presence of good fatty acids keeps the cholesterol in check. The abundance of potassium levels in milk helps to reduce blood pressure.

- **Improve Brain Health:** the lipids in goat milk can reduce anxiety. Goat milk also contains conjugated linoleic acid, which is known to influence brain development.

Precaution while using Goat Milk: Goat milk has to be used with some caution as the sole source of milk to infants and invalids as it results in a deficiency known as "goat milk anemia" or "macrocytic - hyperchromic megaloblastic anemia" which was originally in infants fed exclusively on goat milk in Europe during the second and third decade of twentieth century. Folate is essential for synthesis of hemoglobin which is lacking in goat milk. Hence, folate supplementation to goat milk is essentially recommended before feeding it to infants. Further, goat milk, just like cow milk, is also advised to be diluted to reduce the level of protein, and to be fortified with carbohydrate and certain lacking vitamins before feeding it to babies, especially those less than six months of age.

Conclusion: Goat milk contains higher amount of Ca, Mg and P than cow and human milk. Medium Chain Triglycerides (MCT) which are more in goat milk have been recognized as unique lipid with unique health benefits. The soft curd of goat milk may be an advantage for adult humans suffering from gastrointestinal disturbances and ulcers. The consumer acceptance of goat milk and its products is reported to be excellent. Despite these all facts, goat has remained neglected in research and development. Goat now has to be fully exploited to get maximum benefits, particularly meat, milk and milk products which are having medicinal values.

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