

Therapeutic Benefits of Donkey Milk

Shareen Banga

Ph.D Research Scholar, Department of Food and Nutrition

Punjab Agricultural University, Ludhiana, Punjab

Corresponding author: shareenbanga77@gmail.com

ARTICLE ID: 049

Introduction

India is the largest producer of milk. Significant portion of milk produced in India is utilized for the production of Indian dairy products. Till date milk and milk products are given at most importance. Since ancient times, it was believed that milk and milk products have many benefits which were well known to cure diseases. Recent scientific studies indicate that Indian dairy products are not only delicious but also have certain health benefits and therapeutic values. Major components of milk are water (86-88%), fat (3-5%), protein (3-4%), lactose (4.5-5%) and minerals (0.7%). Milk is also composed of other components like phospholipids, sterols, vitamins, enzymes, pigments, etc. milk has an important role in the maintenance and development of human body besides contributing to its other therapeutic and beneficial effects. For instance, casein, whey proteins and immunoglobulin's, conjugated linoleic acid (CLA), lactose, and minor oligosaccharides like prebiotics, phosphorous, calcium, riboflavin, vitamin D, and various probiotic bacteria such as Bifido bacterium bifidum are present in milk and dairy products as the major nutrients for promoting health and for the maintenance of the human body.

India is the leading country in buffalo husbandry followed by Pakistan and China. Globally, India produces 70% of Buffalo milk (BM) while contribution by Pakistan, China and Egypt is 20%, 5% and 4% respectively. Buffalo milk is ranked second after cow milk in the world as the buffalo milk produced is more than the 12% of the world's milk production. BM has a higher content of fat, lactose, casein, whey proteins, and minerals than cow milk (CM). Research on donkey milk has dramatically increased over the past few years, offering an insight into its unique functional properties, mainly, anti-microbial activity, immunomodulation, and hypoallergenicity, especially highlighting its effect on human health.

Donkey's milk composition is similar to that of human milk rather than other dairy animals (e.g. cow, buffalo, sheep, goat, and camel).



More precisely, donkey milk and human milk have same lactose, total proteins, and whey protein contents. Casein present in donkey milk is much lower than those present in cow milk. The reason why donkey's milk is so similar in macro-composition to human milk is still unclear, especially as donkeys and humans are not phylogenetically related.

Over the centuries donkeys have spread in Asia, India, South America, and South Europe. In the 19th century, upper society or urban people consumed donkey milk, but poor families use to save it for a sick child or a weakened old person. Donkey's milk has been known to be used in maternity hospitals and to feed infants. Furthermore, until the beginning of the 20th century, donkey's milk was marketed for the feeding of orphan infants, unhealthy children, sick people and the elderly. The great majority of donkeys are present in Asia (43.3%) and Africa (37.6%) of the total population, while the America and Europe represent 17.3% and 1.8% respectively (FAOSTAT 2012).

Chemical composition of donkey's milk

Donkey's milk composition resembles that of human milk rather than other dairy animals (e.g. cow, buffalo, sheep, goat and camel). Precisely, donkey and human milk have similar

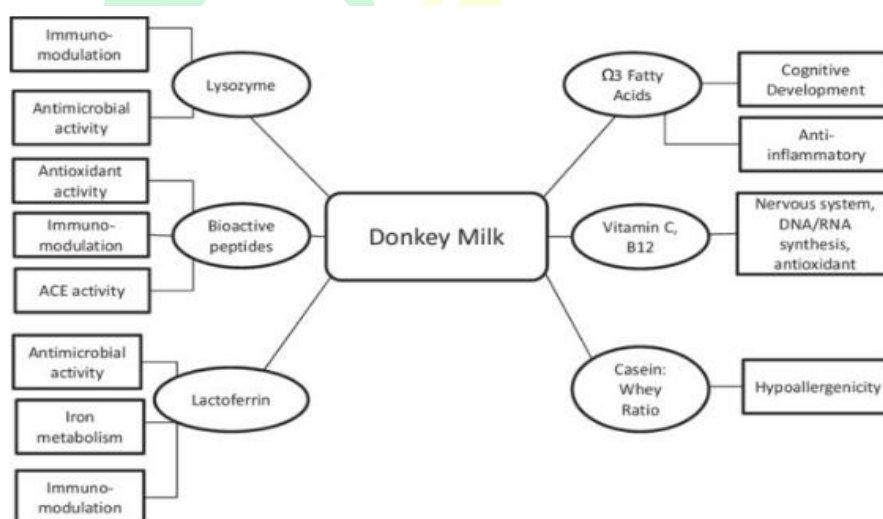
lactose, total protein and whey protein contents. Donkey milk shows a homogeneous nutritional profile which is beneficial and will be utilized by sensitive populations (infants and elderly). The total protein content of donkey milk is quite low (1.5-1.8 g/100g) as compared to bovine milk (3.1-3.8 g/100g) and is closer to the corresponding human milk (0.9-1.7 g/100g). The protein fraction of donkey milk is rich in whey proteins, representing 35-50% of the nitrogen fraction. Donkey milk has high amino acid profile as it consist of higher levels of serine, glutamate, arginine and valine and much less cysteine. Donkey milk is rich in polyunsaturated fatty acids (PUFA), with a higher percentage of linoleic acid, a low omega 6 to omega 3 ratio (LA/ALA ratio), and high levels of unsaturated/saturated fatty acids content. Therapeutic benefits of donkey milk are it has: immune-stimulant properties, cholesterol-lowering agents, preventing the formation of blood clots and minimizing the risk of coronary heart disease, hypertension and thrombosis.

The lactose content of donkey milk ranges from 6-7% and is higher than that of cow milk (4.1-4.4%). High lactose content promotes the osteogenesis processes, facilitates the intestinal absorption of calcium and phosphorous, influences the mineral accumulation in bone structure, which helps in the prevention of osteoporosis. Lactose present in donkey milk is responsible for the good taste and palatability. Donkey milk has a lower amount of vitamin A and E as compared to bovine and human milk. However, the total vitamin C content present in donkey milk represents the recommended daily intake of vitamin C for children aged 6-12 months.

Donkey milk's bioactivity

- **Anti-infective factors:** Donkey's milk has a high lysozyme content ranging from 1 to 4 mg/mL which has the positive influence on gut microbiota. It is suggested that a milk with high concentration of lysozyme can divert the microbiome of the gut of infants towards a microbiome that is linked to a healthy status. For example: lysozyme favours the colonization of bifidobacteria in infant's gut. Approximately 75% of donkey's milk lysozyme remains intact after digestion by human gastrointestinal enzymes. Studies shows that donkey's milk can indirectly support immunity by enhancing Paneth cell mediated innate immunity.

- Metabolism:** Donkey milk is found to be associated with improved glucose and lipid metabolism. It showed an increase in energy expenditure and hypolipidemic effect together with improved mitochondrial activity and proton leakage as well as reduction of inflammatory status which was associated with improved metabolism of glucose and lipids.
- Other bioactive compounds:** in addition to the antimicrobial and gut modulating effect of lysozyme, several proteomic and peptidomic studies have identified the bioactive properties of donkey milk. Donkey’s milk can be used as a hypoallergenic natural milk alternative for CMPA (Cows milk protein allergy) infants in conjunction to their diet or to be used as a replacer of the protein source in infant formulas i.e. as a replacer of extensively hydrolyzed milk proteins or even amino acids.



Functional properties of donkey milk

Preterm infants: donkey’s milk as a new human milk fortifier

Human milk is always considered as the first choice for the nutrition of all infants, including preterm newborns. However, a very-low birth weight (VLBW) infant has increased needs and hence the energy, protein and mineral content of human milk are inadequate. For the reason human milk is fortified when is intended for VLBW infants. The fortification of human milk is a critical intervention because it should meet the nutritional needs for normal growth of the newborn. Clinical studies illustrated that donkey’s milk is well tolerated (82.6%-88%) by infants.

Conclusion

It is becoming more evident that donkey milk has unique nutritional properties comparable to those of human milk. Due to its tolerability (i.e. digestibility, palatability, low-allergenicity) and presence of bio-active compounds (e.g. lysozymes) donkey milk could be used as a dietary supplement, in conjunction to a balanced diet which will provide the therapeutic benefits to human health. It could also be considered as a direct replacement of protein sources from various infant's formula (extensively hydrolyzed proteins or pure amino acid).

