

Camel: A Resilient Desert Companion with Remarkable Adaptations

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Abstract

Camels, including dromedary camels, are multipurpose animals that have been an integral part of human civilization in arid and semi-arid regions for centuries, serving as a vital source of food and transportation. These desert-dwelling animals possess remarkable adaptations that enable them to thrive in harsh environmental conditions characterized by water scarcity and high temperatures. Their survival is facilitated by a combination of physiological, anatomical, and behavioural adaptations. Physiologically, camels exhibit water conservation abilities, unique blood features, efficient thermoregulation, and optimized digestion and metabolism. Anatomical features such as specialized skin, eyes, ears, humps, poll glands, nostrils, lips, large body size, and broad foot pads contribute to their desert survival.

Introduction

Camel is a multipurpose animal that is the only source of food and transport for people in arid and semiarid areas and used for centuries in different parts of the world especially in Asia and Africa. Camels including Dromedary camels are desert animals that can withstand harsh environmental conditions by different adaption mechanisms that help them to survive successfully in dry and arid climates where there is a shortage of water and high environmental temperature. For survival in the desert environment, camels have physiological, anatomical and behavioural adaptation mechanisms. Water conservation ability, the unique features of blood, thermoregulation, and efficient digestion and metabolism are among the physiological adaptations. Anatomically the nature of skin coat, eye, ear, hump, poll gland, nostril and lips, large body size and long height and large foot pads

contribute to their survival. Moreover, the feeding, drinking, thermal and sexual behaviour of camels also plays a major role in succeeding in their existence in the desert environment. Despite their great contribution to the livelihood of many pastoralists in different parts of the world in which other animals face difficulties, camels are the most neglected domestic animals by the scientific community. Bikaneri, Jaisalmeri, Kachchhi, Mewari, Mewati, Malwi, Marwari and Jalori. Kharai breed being the latest breed to be



registered by NBAGR. (Anonymous,2020).

General Appearance

- At least one hump on their backs.
- Long curved necks.
- Broad, large feet.
- Tufted tails.
- Four teats rather than two.
- Annual molt.(Kadim, I. T.,2010)

Physiological Functions

How do camels survive in deserts?

Camels are well suited to their desert habitats, with numerous clever adaptations that help them to tolerate extreme hot and cold environments. Camels are part of a group known as camelids. This makes them close relatives of llamas, alpacas, guanacos and vicuñas, which are all native to South America. There are three species

of camels living today and most are domesticated. The one-humped dromedary (*Camelus dromedarius*) is found in dry regions in Africa and Asia, including the Sahara Desert and Middle East. The domestic Bactrian camel (*Camelus bactrianus*) is found across Central Asia and the wild Bactrian camel (*Camelus ferus*) is found in remote parts of Mongolia and China and is critically endangered (Yadav, S., 2021). Domestic and wild Bactrian camels have two humps.

Why do camels have humps?

A hump is Camel's energy storage. Camels' humps are often associated with these animals' ability to go for long periods without taking a drink. But they don't store water in them. Instead, their humps are made of fat (Rahim, S. M. A., 2011). Camels are generally found in areas with limited water and vegetation. Their fat store can be converted to energy when they don't have access to the resources they need to survive. Dromedary and Bactrian camels apart by the number of humps they have. These are one-humped dromedaries. To last for prolonged periods in dry areas, camels have also adapted to minimise the amount of water they lose. For example, camels have thick, syrupy urine and their faeces are so dry that they can be used as fire starters. A camel can also use its nose as a dehumidifier. When we breathe, the air we exhale is at body temperature and we lose water in it as vapour. But when air passes out over a camel's mucous membranes it is cooled and the water vapour is removed and reabsorbed into the body. This saves them from losing water with each breath. Camels can withstand a loss of up to 30% of their bodyweight in water, which is far more than most other mammals could survive. But they cannot go without water forever. When camels can drink, they take in vast amounts of liquid quite quickly, but they don't store it for later, so it's just enough to rehydrate themselves.

Extreme heat and cold are no sweat for a camel

Camels are adapted to live in extreme environments, both hot and cold. Bactrian camels have a thick coat to help them keep warm when the temperature drops. Unlike a lot of other mammals, most of a camel's fat is stored in its humps, which allows for better thermoregulation. It makes it easier for them to release heat from their bodies in hot weather. Camels rarely sweat. They are much better than us at tolerating hot weather. Their body temperature fluctuates, rising in the day with the increased environmental temperature and falling at night when it is cooler. It might seem strange that camels are furry when they can be found in extremely hot deserts, but their coats actually serve

as insulation, protecting them from the heat. In fact, shorn camels tend to sweat more. Desert sand can be scorching, so camels have leathery, heat-resistant pads on their feet, knees, elbows and sternum so they can lie down without getting burnt. They also lack a stifle fold. In other animals, this is the skin that stretches from the abdomen to the thighs. Camels don't have this, so when they are lying down, air can continue to circulate under their bodies. When camels lie down, the lack of a stifle fold means that air can easily circulate under their bodies, which helps to keep them cool. But while camels are often thought of as being found exclusively in hot areas, some can also be found in much cooler regions.

How do camels walk on sand without sinking?

Sand and other soft surfaces can be tricky to walk on. Sinking into the ground means it takes more effort and energy to take each step. Camels can weigh up to 1,000 kilograms, with males often much larger and heavier than females. Rather than small hooves, camels are equipped with wide snowshoe-like feet with two toes (Gahlot, T. K., 2007). The large size and round shape of their feet help camels to distribute their weight, preventing them from sinking. The large size and round shape of camels' feet helps prevent them from sinking into sand and other soft ground.

Why do camels have long eyelashes?

While you might not spend too much time thinking about your eyelashes, these little hairs play a very important role as your eyes' first line of defence. Eyelashes keep dust and dirt away from our sensitive eyeballs. This function is particularly important for camels who often live in dry and dusty environments. Their eyelashes are often noted for being particularly long. But if a camel's long eyelashes and bushy brows aren't enough and debris does get into their eyes, these animals have a third eyelid that can sweep it out like a windscreen wiper. This thin structure is known as a nictitating membrane.

What do camels eat?

Desert environments can offer limited food options for herbivorous camels. Their lips and tongues are tough, and they have mouths lined with firm papillae (fleshy protrusions). These help camels manipulate and swallow their food, but also prevent it from scraping, poking or otherwise injuring their mouths. Camels can safely eat thorny plants thanks to their tough lips and the firm papillae lining their mouths (Gahlot, 2007). When a camel swallows food, it passes into a chamber of their stomach called the rumen, where it begins to ferment and soften with the help of microbes. The

animal then regurgitates this material, which is known as cud, and carries on chewing it before it can be swallowed again and properly digested. Though camels ruminate, they don't have the typical four-chambered stomach seen in true ruminants like cows. Instead, camels are sometimes called pseudo-ruminants.

Table1 : Parameters for camels (Fowler, M. E., 1984)

Parameter	Dromedary Camel (One-Humped)	Bactrian Camel (Two-Humped)
Height (avg. cm)	180-210 cm at shoulder	180-230 cm at shoulder
Body Length (avg. cm)	300-350 cm	250-350 cm
Heart Girth (avg. cm)	230-300 cm	230-310 cm
Body Weight (avg. kg)	400-600 kg	500-1000 kg
Birth Weight (avg. kg)	30-40 kg	35-45 kg

Conclusion

Camels possess remarkable adaptations that allow them to thrive in the harsh, arid desert conditions. Their humps are composed of fat, which can be metabolized for energy when food and water are scarce. Camels are able to minimize water loss through thick, syrupy urine, dry feces, and a nasal ability to recapture moisture from exhaled air. They can withstand severe dehydration of up to 30% body weight loss. Anatomical features aid camels' desert survival as well. Their thick coats insulate against extreme heat and cold. Broad, flat feet disperse their weight to prevent sinking in sand. Long eyelashes and a third eyelid protect their eyes from blowing sand and debris. Tough lips and a mouth lined with papillae allow them to consume thorny desert vegetation safely. Camels exhibit behavioural adaptations too. Their body temperatures fluctuate to conserve water. When resting, they lack a stifle fold, allowing air circulation to cool their bodies. Their unique digestive system involves regurgitating and re-chewing cud to aid digestion of poor desert forage.

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