Bactrian Camel

Present Status and Prospects

NATIONAL RESEARCH CENTRE ON CAMEL
P.B.NO. 07, BIKANER-334001, RAJASTHAN, INDIA

1. Habitat

The bactrian camel is better known as being the type of camel with two humps. There are only two surviving species of camel remaining, the single humped camels from the Middle East and the bactrian (double humped) camel from the Steppes of central Asia. The **Bactrian camel** (*Camelus bactrianus*) is presently restricted in the wild to remote regions of the Gobi and Taklamakan Deserts of Mongolia and Xinjiang. A small number of wild Bactrian camels still roam the Mangystau Province of southwest Kazakhstan and Nubra Valley in India. Nubra valley of Ladakh (Jammu & Kashmir) situated at 10000 to 12000 ft MSL has become the home tract of double humped camel *(Camelus bactrianus)* in India after the closure of silk route in 1950s. The total area falling under cold desert in India is approximately 74809 sq. km. and lies between 31 ° 44' 57"-36° N and 75° 15'-80° 15' E and has meagre vegetation and extremes of cold temperature ranging from 10°C to - 40°C in winter and 40°C to -10°C in summer. The arid area of this cold region has very coarseporous and immature sand particles and suffer to wind and water erosion.The climate of the area is more harsh because of intense infra and ultraviolet radiationslow pressure of atmospheric oxygen and carbon dioxide, low rainfall of about 2 to 14 mm and very sparse vegetation during winter but luxuriant wild vegetation available during April to August months of summer.

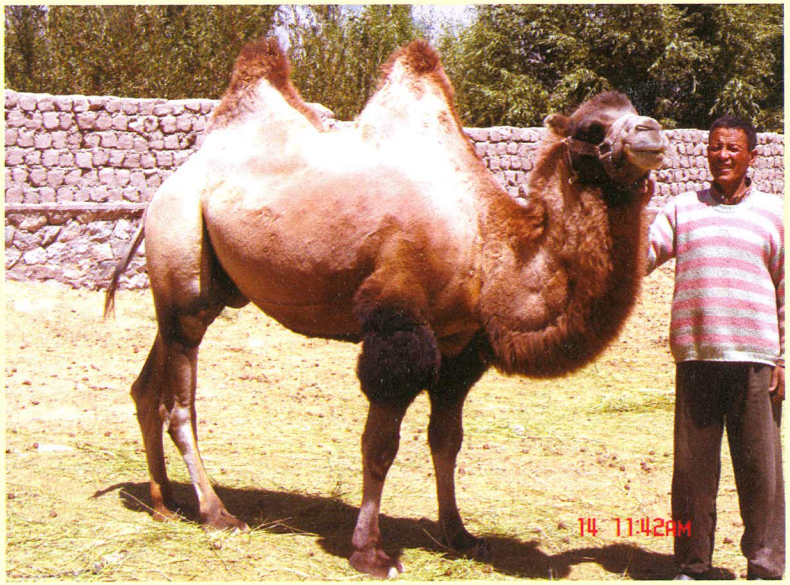
Bactrian camel is adapted to arid plains and hills where water sources are few and vegetation is sparse, often little beyond some drought-resistant shrubs. These camels are migratory, and their habitat ranges from rocky mountain to flat arid desert, stony planes and sand dunes. The camels' distribution is linked to the availability of water, with large groups congregating near rivers after rain or at the foot of the mountains, where water can be obtained from springs in the summer months, and in the form of snow during the winter.

Similarly Bactrian camels belong to a fairly small group of animals who eat snow. The animals living above the snowline are obliged to do this as snow and ice are the only forms of water during winter. The latent heat of snow and ice is enormous compared with the heat capacity of water, demanding a large sacrifice in heat energy and forcing animals to eat only small amounts at a time.

2. General Features:

An average bactrian camel stands 6 to 7.5 feet (1.8 to 2.3 meters) in height and weighs between 1,000 and 1,575 pounds (455 and 715 kilograms). The long, woolly coat varies in colour from dark brown to sandy beige. There is a mane and beard of long hair on the neck and throat, with hairs up to 25 cm / 10 inches long. The shaggy winter coat is shed extremely rapidly, with huge sections peeling off at once, almost as if it were shorn off. There are two

humps on the back, which are composed of fat. The face is long and somewhat triangular, with a split upper lip. There are long eyelashes, which, along with the sealable nostrils, help to keep out dust in the frequent sandstorms which occur. The two broad toes on each foot have undivided soles and are able to spread widely as an adaptation to walking on sand. The coat of a wild bactrian camel is short and gray-brown in colour; that of a domestic or tame version of the animal is long and dark brown.



Proud Owner

Unlike cattle, which lose 7 to 8 percent of their body weight per day if they have no access to water, the bactrian camel loses only 1 to 2 percent, which means that it can survive for two to three weeks without water in exceptional circumstances. It can also take in more than 100 litres of liquid (150 litres in the case of lactating camels) within a few hours. It can be assumed that other large mammals would die if they loose 25 to 30 percent of their body weight through dehydration, which means that cattle can go without liquid for three to four days at the most. In autumn and winter, the camel can meet part of its water requirement through snow intake.

3. History:

Bactrian camel name comes from the ancient historical region of Bactria and were domesticated (independently of the dromedary) sometime before 2500 BC, probably in northern Iran, Northeast Afghanistan, or south-western Turkmanistan. The dromedary camel is believed to have been domesticated between 4000 BC and 2000 BC in Arabia and is included in the Order Artiodactyla, Sub-order Tylopoda, Family Camelidae, Genus *Camelus* and Species *bactrianus*.

The wild population of Bactrian camels was first described by Nikolai Przhevalsky in the late 19th century. Bactrian camel, native to Gobi desert of Asia was introduced as a draught animal in Ladakh by the travellers of Yarkand in the 19th century, through the silk route and since then this animal has adapted itself in this area due to its economic viability. With the closure of silk route in early fifties, camels belonging to local traders were left in Ladakh.

4. Population:

Total world population was about 2.2 millions (FAO, 1994) most of which is confined in high land of Central Asian countries viz. Mongolia; China, Kazakhstan, Turkmenistan, North Eastern Afghanistan and Uzbekistan.

NRC on camel Bikaner, conducted studies in an ICAR AP-Cess fund scheme on "Evaluation and conservation of double humped Camel in cold desert region." According to initial survey during 1996 the population of double humped camel *(Camelus bactrianus)* was found to be 76 confined to the 4-5 villages of the Nubra valley of Ladakh, situated at an altitude of 10,000 to 12,000 ft MSL. The latest survey during November, 2000 indicated population of about 105 camels indicating an increase in the population and positive impact of the scheme among camel keepers. Recent figures as obtained during 2011 visit of scientists and also from the double humped camel breeders association states that the population has increased to about 172 camels.

Conservation :

While domesticated camels number over 2 million, the wild Bactrian camel is classified as endangered by the IUCN (1996). The Bactrian camel was identified as one of the top ten "focal species" by the Evolutionarily Distinct and Globally Endangered (EDGE) project, which prioritises unique and threatened species for conservation. Bactrian camel, native to Gobi desert of Asia was introduced as a draught animal in Ladakh by the travellers of Yarkand in the 19th century, through the silk route and since then this animal has adapted itself in this area due to its economic viability. With the closure of silk route in early fifties, camels belonging to local traders were left in Ladakh. Even after closure of K. K. trade route with Yarkand, rapid expansion of roads in the recent past, the rearing and maintenance of small population of double humped camel became unprofitable and the survival of this species in this region was endangered. The camels were left open for grazing in forest of Nubra valley near the banks of river Siachen and Shayok round the year with close inbreeding going on since near more than last 4 decades.

To conserve this endangered species National Research Centre on Camel, Bikaner initiated an Indian Council of Agricultural Research (ICAR), AP cess funded ad-hoc research scheme on "Evaluation and conservation of double humped camel in cold arid region" in collaboration with Field Research Laboratory (FRL), Leh (J&K), Defence Research Development Organization (Govt. of India) with a total out-lay of Rs.47.40 lakhs from July, 1996 to June, 2001 with following objectives.

1. To conserve the genetic resources of the bactrian camels.
2. To evaluate and improve the productive and reproductive performance of double humped camel.
3. To collect basic data on draught potential, physiology, genetics and breeding for future improvement and selection.

Major Research Achievements

1. Biometrical observations :

Biometrical data were recorded and significantly higher body length (P<0.05), height at wither (P<0.0l), Face length (P<0.05), leg length (P<0.0I), distance between eyes (P<0.0l), hump circumference [front] (P<0.0l) and muzzle diameter (P<0.05) were observed in males than in the females. The bio-metrical parameters will be helpful in selection of male studs as well as for breed characterization programmes.

Biometrical Parameters of double humped camel

Parameters	Male (n= 3)	Female (n=12)	Overall (n = 15)
1. Body length	174.00±3.80	150.08±1.90	162.04±2.12 **
2. Height at wither	172.66±3.96	154.25±1.98	163.45±2.21 * *
3. Face length	61.00±1.88	56.00±0.94	58.50±1.05 *
4 Leg length	135.66±3.94	122.00±1.97	128.83±2.20 * *
5 Distance between eyes	31.33±1.30	24.75±0.65	28.04±0.73 **
6. Muzzle diameter	50.00±1.92	43.91±0.96	46.95±1.07*
7. Hump circumference (Front)	96.33±4.12	81.33±2.06	88.83±2.30 **

2. Polymorphism Study :

Isolation of Genomic DNA of bactrian and dromedary camels and digestion with the restriction enzyme *Hind* III, *Pst* I and *Pvu* II indicated the nature and organisation of the repetitive DNA in the two species of camel is not exactly the same. Study of genetic variability between the species of camel viz. *Camelus dromedarius* & *Camelus bactrianus using* random oligo nucleotide primers Polymerase Chain Reaction (PCR) based Random Amplification of Polymorphic DNA (RAPD) technique indicated genetic polymorphism between single and double humped camel. The genetic variation was more between the two species as compared to within species variation. Genomic DNA samples of double humped camel along with that of single humped camel, sheep, goat, cattle, buffalo, horse & donkey were studied with a single set of PCR primers. A single band of 237 bp was amplified in bactrian camel where as two bands of 237 bp and 288 bp were amplified in dromedary camel.

Biochemical polymorphism study to investigate the variation in double humped and single humped camel carried out using 7- system viz. Haemoglobin (Hb), Transferrin, Albumin, Amylase, Phospho-Hexose-Isomerage (PHI), Glucose 6-Phosphate (G-6-P-D) and Acid Phosphatase (ACP) indicated that Amylase and Transferrin were non-Polymorphic in single humped camel, while preliminary data indicated polymorphism between the two species of camel.

3. Haematological and Mineral Status :

In attempt to study the adaptive mechanism blood samples were analyzed for various Haematological parameters including haemoglobin (Hb), erythrocyte sedimentation rate (ESR) and differential leucocyte count (DLC). Macro and micro-minerals

were also studied for calcium (Ca), phosphorus (P), magnesium (Mg), zinc (Zn), iron (Fe), copper (Cu), cobalt (Co), manganese (Mn) and molybdenum (Mo). The results presented in Table indicated higher blood haematological and most mineral profile in bactrian camels.

Table- **Determination of blood cells and minerals in Bactrian camels**

Parameters	Single humped	Double humped
Hb(g/dl)	lO.75±l.O8	12.50±1.17
ESR (mrn/hr)	1.73±O.09^{A}	2.47±O.151j
Neutorphils (%)	53.44±O.72^{d}	*56.50±O.5r*
Eosinophils (%)	4.12±O.20'''	6.17±0.28 $_{b}$
Lymphocytes (%)	35.22±O.62^{d}	33.00±O.74 $_{u}$
Monocytes (%)	3.78±O.49	4.17±O.28
Calcium mg/dl	9.73±1.12^{d}	15.09±2.26°
Phosphorus mg/dl	5.55±O.53^{A}	8.54±O.86 Ij
Magnesium (Mg) mg/dl	2.85±O.31	3.08±O.65
Zinc (Zn)~g/dl	113.60±10.52^{A}	197.75±16.751j
Iron (Fe)~g/dl	118.50±4.53^{A}	145.00±5.121j
Copper (Cu)~g/dl	123.00±5.3^{A}	187 .OO± 7 .801j
Cobalt (Co) ~g/dl	1.18±O.47	l.O6±O.31
Manganese (Mn) ~g/dl	18.43±2.33	17.86±3.26
Molybdenum (Mo)~g/dl	Very low	Very low

The serum Ca and P levels were significantly higher in double humped camels but Mg level was found to almost similar in single and double humped camels. The concentration of micro-minerals Zn, Fe and Cu was significantly (P<0.01 higher in bactrian camels (l97.75±16.75; 145.00±5.l2 and 187.00±7.80 IJg/dl) as compared to single humped (l13.60±10.52; 118.50±4.53 and l23.00±5.33 IJg/dl) camels. Higher level of Hb and Fe are likely to be associated with adaptive mechanism of the double humped camel to withstand the harsh climate of the high altitude. The types of feed/ fodder available in the area also play an important role as it may influence intestinal absorption and utilization of nutrients.

4. Hair quality evaluation and utilization

Hair being the important parameter of double humped camel; hair samples from different body sites were collected and evaluated for various fibre quality attributes (fibre diameter, staple length, per cent pure, hetero and hairy fibres, tensile strength and elongation per cent etc.) to explore its utility for the preparation of various productsitems viz. shawls, sweaters and coat etc. from pure fibre and blended forms under village cottage industry. Age wise the average annual hair production per camel ranged from 2.5 to 4.0 kg., however, in Mongolian double humped camel it ranges from 5.2 to 10.8 Kg. Sex, age wise and site wise least-square means of hair quality attributes presented in Table indicated significant differences (P<0.0l) among most of the hair quality attributes when compared for different sites (shoulder, mid-side, hump, neck and thigh) but the difference were nonsignificant between the sex. The staple length was found highest in the hump site 13.25±1.03 cm while the mean fibre diameter was lowest at thigh 14.56±3.56 fl. Comparison between two age groups revealed that the staple length of calves (below 6 month of age) was slightly higher 8.92±1.63 cm than the adults (above 3 years) 7.32±0.58 cm

but mean fibre diameter was lower (P<0.0l) 15.82±3.67 fl in calves as compared to 30.97±1.77fl in adults. The staple length and mean fibre diameter indicated superiority of calf's fibre as compared to adult.

Quality Hairs from various Regions

Table - Hair quality attributes

	No. obs.	Staple length	Mean fibr diameter ± SE (IJ.)	Percentage of Fibres		
				Pure	Hetero	Hairy
Sex						
Male	15	8.42±1.18	23.03±2.92	65.18±3.8	26.53±2.90	8.13±1.92
Female	41	7.82±0.92	23.77±2.29	61.52±2.9	28.49±2.28	9.60±1.50
Site		**	**	**	**	NS
Should	12	8.38±1.29	26.41±3.19	60.52±4.1	28.53±3.17	10.10±2.1
Mid-	12	5.37±1.16	16.38±2.88	*n.31±3.7*	19.79±2.87	8.20±1.90
Hump	12	13.25±1.0	30.74±2.54	59.94±.31	29.80±2.52	9.76±1.67
Neck	12	10.45±1.1	28.90±2.86	56.56±3.7	36.41±2.84	6.68±1.88
Thigh	8	3.15±1.44	14.56±3.56	67.41±4.6	23.03±3.54	9.60±2.34

Table - Hair attributes of different age groups of Bactrian camel

	No. of obs. (n)	Staple (cm)	Mean fibr diameter ± SE (IJ.)	Percentage of Fibres		
				Pure	Hetero	Hairy
Age		N.S.	**	*	*	N,S.
Below 6 months	16	8.92±1.63	15.82±3.67	70.08±9.1	23.24±3.8	6.58±5.34
Above 3 years	40	7.32±0.58	30.97±1.77	56.62±2.6	31.78±1.9	11.15±0.61
Overall	56	8.07±1.02	26.23±2.51	56.08±3.2	27.51±2.3	8.87±1.53

5. Assessment of Work Potential

Basic data on baggage and draught utility, physiological and biochemical aspects, genetics and traditional management practice of bactrian camel was collected and analysed. In working camels wooden nose peck are inserted at around 3 years of age and then camels are being trained for work for short pe-riod. Before arrival of winter working camels are used for transportation of fodder, fuel wood, stones and manure etc. for a period of about one month. As per the practice some of the trained double humped camels are used as baggage animals for short distance

transporta-tion of various items viz. fodder, manure, sand, fuel wood and stone etc. before onset of winter with average load of 100-150 kg. A small camel cart was also introduced under the scheme to explore the transport utility for shorter distance transportation under cold arid region. Data available on draught power of bactrian camel from other sources indicated that it can carry load around 40% of the live weight with a maximum of 250 kg.

Study of biochemical, haematological and mineral profiles of dromedary and bactrian camels indicated no significant vari-ation in the biochemical profiles except for serum urea and the difference could be due to dietary intake of nitrogen. Urea metabolism is also closely related to the energy value of the diet and improved the utilization of energy. The bactrian cam-els require comparatively more energy to sustain the body temperature in cold desert region.

Table- Blood Biochemical attributes

Sl. No.	Parameters	Double humped	Single humped
1	Lactate dehydrogenase	599±43.17	667 ± 54.34
2	(LDH) *IU/lt.*		
3	Aspartate transaminase (AST) IU/lt.	77.33 ± 7.52	69.99 ± 5.12
5	Alanine transaminase (ALT) IU/lt.	24.81 ± 7.09	12.22 ± 0.68
7	Triglycerides mg/dl.	13.79 ± 3.78	15.22 ± 1.92
8	Total protein *mg/dl.*	7.13 ± 0.20	6.44 ± 0.19
9	Urea mg/dl.	32.38 ± 2.00^{A}	23.31 ± 1.44^{B}

6. Fodder Evaluation :

In the valley Lucerne/alfalfa locally called "OLE" remains the main and only cultivated legume fodder which also grows as wild. The fodder plants are dominated by legumes and grasses. The legumes are richer in proteins than the ordinary grasses and therefore fodder is nutritious if legumes are grown along with grasses. The popular fodders of Bactrian camel are known as Tsermang & Alfalfa

Grazing Camel

(Medicago sativa) which are spiny bushes and grasses, respectively. Some important wild fodder species available for feeding camels in the Nubra valley are as follows:

These feed/ fodder plants which are utilized by the camels in the cold arid region were evaluated for proximate and other nutritional parameters and are presented in Table.

Table Various locally available feeds, bushes and grasses utilized by double humped camel found in cold arid region was carried out.

Local name	Botanical name	Plant Characters
I.Zamak	*Agropyron repens (Linn.) Beauv.*	A tufted perennial grass. Stem erect up 80cm. glabrous, fistular.
2. Wild oat (E)	*Avenafatua (Linn.)*	An annual erect herb.
3.Jamak	*Bthriochloa ischaemum(Linn.) Keng*	A perennial tufted grass.
4.Seri	*Cicer microphyllum Benth.*	A spreading glandular-hairy perennial
5.Tiktickn la	*Convolvulus arvensis*	A slender climbing perennial herbs.
6. Ole/alfalfa	Medicago sativa	An erect or semi-spreading perennial
7.Tsermang	*Hippophae rhamnoides*	Perennial spiny bushes
8.Yakjak	*Stachys tibetica (vake)*	A low much-branched perennial shrub.
9.Umbo	*Myricaria germanica*	A perennial shrub
10. Jantic	*Myricaria gallica*	A perennial shrub

Table- Chemical composition of various Feeds/fodder's utilized by Double humped camel in cold arid region of Ladakh

Plants	CP	CF	EE	TA	NFE	NDF	ADF
A. Trees							
I.Changma (leaves)	14.00	6.67	2.61	11.47	65.25	28.30	16.96
2. Chhowkchang (leaves)	12.43	9.33	4.55	8.18	65.51	32.25	22.74
3. Chhowk (leaves)	18.55	8.63	5.82	7.39	59.61	30.92	16.53
4.Mericaria gallica (J antik, leaves)	10.50	10.76	5.50	11.76	61.48	-	-
B. Creeper Beecho (Whole)	13.13	22.40	5.73	15.25	43.49	38.88	29.18
C. Crop							
Alfalfa (Medicago sativa)	15.23	33.00	1.93	9.10	40.74	51.85	40.62
D. SHRUBS							
I.Mericaria sativa (Ambu, Leaves)	8.23	11.26	2.08	17.84	60.59	34.60	*
E. Grass							
1. Longtol (whole)	6.65	32.14	3.80	9.41	48.00	63.35	42.35
2. Burche (whole)	11.20	31.85	3.63	8.42	44.90	64.81	44.38

7. Health Management

Surveillance data indicated higher mortality in the new-born calves as compared to adults is mostly due to accidental ground such as drowning etc. in nearby rivers of Nubra val-ley. The common diseases prevalent in bactrian camels are contagious cough, vaginal and prepucial myiasis, fungal dis-ease caused by *Trichosporum capitatum,* Herpes encephali-tis, diseases caused by *Thelazia leesi, Dictyocaulus cameli* and other common helminths, osteoporosis, senile plaques, influenza virus, multiple lipomas of liver. However, screening of faecal and blood samples in bactrian camels revealed no helminthic or protozoan infec-tion. In contrast to dromedary, ectoparasite and skin affec-tions are not common in bactrian camel.

8. Reproduction

The breeding takes place in winter season under rangeland conditions within the small herd of double humped camel in the cold desert. It appears that the closed breeding is taking place since last many years .

Calf

9. Management Rearing Systems :

In traditional management system followed for the double humped camels the zero input management system is followed except for winter months. During winter the newly born calves and their mothers are reared under semi intensive system for a period of 3 months i.e. December to February. As per the practice no herdsmen follow the camels in rangeland and are supervised only according to their requirements. The Lucerne/ alfalfa locally called "Ole" is the main and only cultivated legume fodder, which also grows wild. Even people harvest certain wild plants and dry them properly for winter use. Legumes and grasses dominate the fodder plants. In addition, the fodder like oat (Avena fatua), Zamak (Agropyron repens) etc. are grown and generally utilized for feeding to bacterian camel.

Camels in organised farm

Future Prospects of Bactrian Camel

Bactrian camels have following potential uses that distinguish them from cattle with regard to productivity:

Milch Animal

The available literature indicate that the milk yield of the bactrian camel is lower than that of the dromedary and amounts to between 1000 and 1500 litres per year. The maximum yield is reached in the third month of lactation. The dromedary has a much higher milk yield of 1500 to 2500 litres per lactation. The milk is rich in fat (5 to 7 percent). The milk of bactrian camels generally has a higher fat content than that of dromedaries, which means that it also has higher calorie content. It contains 5 percent lactose and 4 to 5 percent protein and shelf-life of camel milk differs greatly from that of cow milk. At a summer temperature of 40°C, camel milk retains its typical odour for up to 12 hours. At temperatures below 10°C, camel milk can be stored for up to 60 hours without souring and, therefore, without loss of quality.

In other parts of world the milk from double humped camel is fermented to make a sour-tasting drink called "schubat". The method for making this drink is similar to the process used to make "kumys" from cow milk. In addition to "schubat", camel milk is used to make butter, cheese, curd and yoghurt. "Schubat" is also administered to both humans and animals to treat diseases of the respiratory or digestive systems.

Meat Animal

The meat of Bactrian camel has coarser fibres than beef but is comparable with lean beef in terms of quality. Camel meat has a high biological value. The colour of the meat is rasp berry red to dark brown, and it has a sweet taste because of the high glycogen content. The slaughter yield of bactrian camels is between 50 and 60 percent, and the fat content is estimated at 8 to 18 percent. The energy content per kg meat is 1200 to 1200 kcal. In terms of consistency, bactrian camel meat is similar to beef. It is eaten both fresh and dried.

Suckling Calf

Double humped camel with two wheel camel cart

Wool Production Potential

The double humped camel hair and its products can be an important source of additional income for farmers inhabiting in cold region. The annual hair production of adult camels varies from 3 to 4 kg per Indian double humped camel, whereas annual hair production is 6 to 8 kg from Bactrian camels of Mongolia and Kazakhistan. The longest, finest densest fibers are from the shoulder region of body of camel. The total yield of the male is about 30 % higher than that of females Bactrian camel. The quality of the wool of the young animal is finer as compared to adult camel.

Utilization of Hair :

The hair is spun by camel keepers by using traditional simple techniques. The coarse variety is spun by hand. The other method of spinning fine quality camel hair is by hand charkas. In the recent times machine spinning is becoming popular for carpets, dummies and clothing. The preliminary results of camel hair blends with wool silk waste and polyester have shown encouraging results. Blended products may also be prepared with sheep wool goat hair and cotton. It is worthwhile to blend camel hair with polyester, wool of silk waste. Hair is one of the important production traits of Bactrian camel, which is extensively used for manufacture of various items like shawls, coats, caps, sweaters and hand gloves etc. in village cottage sector of this region. Double humped camel's wool is soft and elastic and has good insulation properties too. The fineness of the wool comporable to that of sheep but it is less dense, with fewer scales, the crimps are irregular and the diameter of the individual fiber is uneven, so the spinning quality is inferior as compare to sheep wool.

Unlike dromedaries, bactrian camels have a long, prolific winter fleece, extending as far as the mane and the lower part of the neck. There is an extensive tuft of hair on the frontal side. The forelimbs, starting from the elbow joints towards the head, are covered with long strands of hair. The colour of the fleece varies from russet to dark brown or, in exceptional cases, light grey. The

annual wool yield of a male camel is 12 to 15 kg and that of a female 6 to 8 kg. Hair accounts for about 44 percent of the coat, while down and wool account for about 56 percent. The proportion of usable wool ranges from 80 to 90 percent, since the wool contains only a few foreign bodies and some dust. All woollen products made from camel wool are of an extremely high quality. In Mongolia although camels make up only 2 percent of livestock but they are responsible for 10 percent of agricultural products and 17 percent of the total wool production.

Camel Hair Production

Draught Potential

In the desert Steppes of central Asia the camel still plays an important role as a beast of burden and as a riding animal, although it has lost its dominant status since the second World War. Camels are used for transporting loads primarily in the autumn and winter and to a limited extent in the wet summer months (90 percent of the precipitation falls in the three summer months) because of the high humidity. As soon as autumn approaches, the nomads round up their camels and prepare them for winter trips. In autumn and winter the camels can withstand temperatures as low as -40°C and a high level of travel-induced strain, since the humidity during these seasons is usually lower than 30 percent.

Marco Polo's travel reports infer that, for hundreds of years, silks were transported along the famous Silk Road from China to Europe exclusively by camel. Another point worth mentioning is that Genghis Khan and his commanders used mobile camel residences (command centres). These dwellings could be built up and taken down in a day, and a total of 500 to 1000 camels were used to transport each dwelling. Apparently more than 1 million military camels were constantly used during the Mongolian campaigns to carry the necessary supplies of clothes, provisions and war material for the cavalries in the Mongolian empire, which stretched from the China Sea to Europe - very impressive logistics, even by today's standards.

Camels are also used to transport yurts (circular tents), called "yurt" in Russian and "ger" in Mongolian, of which there are still hundreds in the Gobi Desert. Yurts are usually from 2 to 3 m high and about 8 m in diameter. They can be dismantled within a few hours and transported to another site on the backs of two or three camels. Yurts provide optimum protection from the heat in summer and the cold in winter. Working animals are primarily bulls or castrated males of at least four years old. Their working capacity reaches its peak at the age of seven to eight years. The camels designated for work purposes receive intensive training at the age of three to four. As a rule, adult camels can carry a load of about 40 percent of their body weight. During the summer months camels travel from 4 to 6 km per hour, while in the winter months they can cover 8 to 10 km per hour. On journeys lasting for several weeks, camels cover a distance of approximately 30 to 40 km per day. On shorter journeys, lasting less than a week, they cover 80 to 100 km per day. In exceptional circumstances, bulls are able to walk more than 120 km in a single day, provided that they have a whole day to rest afterwards.

Alternate uses of Camel Produce

Dung As Fuel

Dried camel dung, of which the dry matter content is twice that of dried cattle dung, is one of the few sources of energy available to camel owners in the desert Steppes of central Asia. About 950 kg of dung are collected per adult animal/annum. The compact balls of dung have a high caloric value and are highly rated as fuel. Since the dung burns with a low, long-lasting and virtually smoke-free flame, the women can start cooking well in advance of mealtimes and can leave the tent now and again while the food is being slowly heated. Since the burning process produces little smoke, the yurt dwellers are not exposed to smoke pollution.

Influence of Cross-Breeding and Productive Traits

In modern camel research, the one-humped and two-humped camels are assumed to have the same origins, and crosses between the two species are termed hybrids. According to camel owners, there is a heterosis effect in so far as the working capacity, milk and meat yields of cross-bred camels are improved by 30 to 40 percent. The disadvantages of the F_1 generation are increased susceptibility to disease, higher feeding requirements and lower fat reserves owing to the vestigial front hump. Backcrosses of the hybrids with the one-humped and two-humped camels were abandoned because they yielded no economic advantage.

Researchable Issues

1. To conserve the genetic resource of the bactrian camels available in cold desert region of the country.
2. To evaluate the productive and reproductive performance of double humped camel and measures to improve it.

3. To collect basic data on physiology, biochemical, management, nutrition, genetics, breeding and draught potential for future improvement.

4. To work out the nutritional requirement of the camel, feed resource inventrisation and its evaluation to devise the feeding schedules for various seasons and different physiological stages.

5. To study the present status of health and diseases incidence, and standardized prophylaxis and control measures.

6. To study camel produce (Milk, fibre and dung), its evaluation and utilization for development of various product commercial value.

7. To develop various agricultural and carting implements for double humped camels for improving socioeconomic status of local people of Nubra Valley.

8. To rejuvenate and reestablish the rangelands of Nubra valley with local grasses reseeding,planting of native and adaptable trees and bushes having feed/fodder value.

Training programme cum stakeholder's meet Dec.2011

Training programme of Double humped camel breed association people

Address : National Research Centre on Camel
P.B.No. 07, Bikaner 334001, Rajasthan, INDIA
Phone : 0091-151-2230183, 2230858, 2230070

Fax : 0091-151-2231213
e-mail : nrccamel@inc.in
Contributers : Dr.N.V.Patil,Director
Dr. Raghvender Singh,Dr.Champak Bhakat,
Dr.A.K.Nagpal, Dr.Sumant Vyas,Dr.U.K.Bissa

Booklet Publication No. 3/2012

Published by : **Director, NRC on Camel, Bikaner - 334001**
Printed at : **Surya Prakashan Mandir**
Dauji Road (Nehru Marg), Bikaner - 334005, e-mail:bissa.prashan@gmail.com