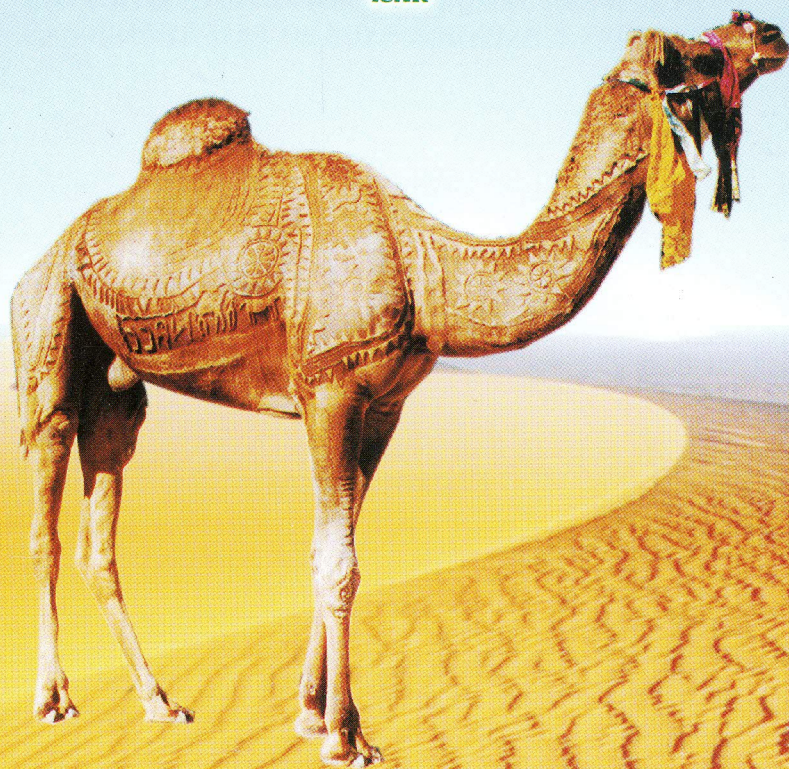


BIKANERI CAMEL

"A BREED DESCRIPTOR"



NATIONAL RESEARCH CENTRE ON CAMEL

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

BIKANER - 334 001 (RAJASTHAN)

BIKANERI CAMEL

“A BREED DESCRIPTOR”

DIGITIZED INVENTORY OF ANIMAL RESOURCES
(A DEPARTMENT OF BIO-TECHNOLOGY PROJECT)



BY

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&

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NATIONAL RESEARCH CENTRE ON CAMEL
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

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FOREWORD

Characterisation of livestock species is of outmost importance for knowing the status of any breed in the breeding tract and for identification of superior sires of a breed for propagation, conservation and preservation of a breed.

Bikaneri camels are being maintained by the National Research Centre on Camel, Bikaner since its establishment in the year 1984. This centre has carried out basic and applied research on various aspects of camel husbandry and developed an elite herd of the breed. Using this herd of Bikaneri breed along with that of Jaisalmeri and Kachchhi various aspects of research on camel such as evaluation of draught potential, reproductive efficiency, milk and hair production potential, physiological and behavioural studies, nutritional studies, ploughing potential, molecular genetic studies, biotechnology, health etc. have been covered.

This project was focused on the present status of the breed but sincere efforts were made by the Project Investigator and his team to collect and compile information on various aspects of this breed in its native tract.

I believe this publication will be useful to field veterinarians, teachers, students, farmers and common men to know about the Bikaneri breed of camel and also to the policy makers, planner and researchers for preparation of future strategies for its conservation and improvement.



M.S. Sahani

PREFACE

Bikaneri breed of camel is well known for its grace and load carrying capacity. Its grace captures the cover pages of several magazines of tourist importance while its load carrying capacity acts as a source of livelihood for rural and urban camel keepers. Due to these features and adaption to desert climate, the Bikaneri camels are in the art and culture of the local society. Technically the camels of Bikaneri breed excels in growth, reproductive efficiency, hair and milk production, load carrying capacity, ploughing etc.

Conservation of livestock species is of tremendous importance because of severe reduction in the genetic variability. Our future generations, for some unforeseen challenges, may require enough genetic variation for genetic improvement of the livestock species of that time. If we realize the situation, it is our moral responsibility to characterize and conserve or preserve the present germ plasm wealth for future.

Characterisation of a breed in present time requires complete documentation about the breeding tract, its environmental features, physical, biochemical, cytogenetic and molecular characterisation. The production parameters, utility and future perspectives of the breed in changing scenario also need to be included. Keeping this in view I took the privilege to characterise and compile the scientific information available about this most preferred breed of camel for the interest of researchers, policymakers, planners, lecturers, scholars and common men.

I acknowledge my sincere thanks to the Director, National Research Centre on Camel, Bikaner for guidance and the scientists of this centre for providing necessary cooperation and information.



S.C. Mehta

BIKANERI CAMEL

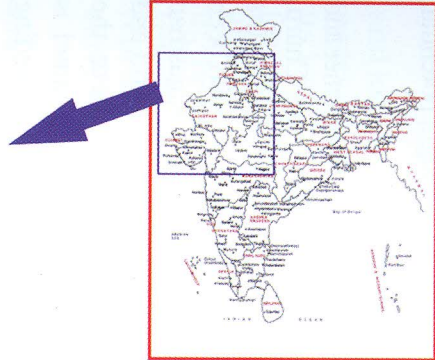
Bikaneri breed of camel is one of the main camel breeds found in India. This breed is known for better draught potential.



HABITAT AND DISTRIBUTION

Bikaneri camels are predominantly bred in Bikaner and near by districts, such as Sriganganagar, Hanumangarh, Churu, Jhunjhunu, Sikar and Nagaur, of Rajasthan and adjoining parts of Haryana and Punjab state. Bikaneri camels have also been used for crossbreeding with other breeds of camel in Rajasthan and adjoining states. The home tract of this breed is arid and sandy with extreme hot and cold climates, where the temperature varies between 1° to 49 °C. Bikaneri camel is prevalent in Bikaner, The population of camel in the breeding tract of Bikaneri breed is estimated to be about 0.347 millions (based on 1997 livestock census).

FEATURES

The camels of Bikaneri breed are heavily built and are attractive with a noble look. This breed has the inheritance of Sindhi, Baluchi and Afghan camels. It is a multipurpose breed but the camels of this breed have been classified as baggage type due to their higher potential to carry loads. It has good height, strong built and active habits. The colour of the coat varies from brown to black, however in some animals reddish tinge is also found. They have symmetrical body and slightly dome shaped head. The fore head has a well-marked depression, termed as "*Stop*", above the eyes, which is characteristic of this breed. Nose is long and extends upto two third of the head. Some camels of this breed have a luxuriant growth of hair on their eyebrows, eyelids and ears, they are called '*Jheepras*'. The chest pad or pedestal is well developed and placed between angles of elbow. The shoulders are strong, broad and well set to chest. Neck is medium sized, fairly erect, with a marked curve giving a graceful carriage to the head. The digitized information on breed characterization is presented in the breed descriptor below.



-  Major Breeding Tract
-  Minor Breeding Tract

Breeding Tract of Bikaneri Camel

BREED DESCRIPTOR

A. GENERAL DESCRIPTION

1. **Name of the breed** : Bikaneri
2. **Species** : *Camelus dromedarius*
3. **Background for such name** : Named after the place Bikaner
4. **Since when breed is known** : Since 15th century.
5. **Communities responsible for breeding/rearing** : Rebaris (Raikas) are the traditional camel breeders, However the other communities involved are Meghwals, Rajputs, Mohammedans, Jats, Charans, Bheels, Jogis etc.
6. **Native environment**
 - a. *Soil description* : Aridsols
 - b. *Temperature range* : 1° C to 49° C
 - c. *Mean minimum temperature* : 0.8° C
 - d. *Mean maximum temperature* : 46.2° C
 - e. *Mean relative humidity* : 39%
 - f. *Annual rain fall* : 260-270 mm.
7. **Feed and Fodder**
 - a. *Dry feeds* : Locally grown leguminou crops, Guar Phalgati (*Cyamopsis tetragonoloba*), Moth chara (*Phaseolus aconitifolius*), Groundnut fodder (*Arachis hypogea*), Chana chara (*Cicer arietinum*) and wheat straw (*Tritium aestivum*) mixed with green fodder.
 - b. *Green fodder* : Bajra, Jowar and Jai.
 - c. *Perennial Grasses* : Sewan (*Lasiurus indicus*), Dachab (*Cyperus rotundus*).
 - d. *Annual grasses* : Ganthia (*Dactyloctenious aegyptium*), Bakeria (*Indigofera corifolia*), Kanti (*Tribulus terrestris*), Sata (*Trianthema portulacastrum*)

- e. *Bushes* : Phog (*Colligonum pologonoides*), Ker (*Caparis deciduas*), Sinio (*Crotolaria burhia*) & Khimp (*Leptadenai pyrotechnica*).
- f. *Trees* : Khejri (*Prosopis cineraria*), Jal (*Salvadora oleiodes*), Israili Babool (*Acacia totlis*) & Neem (*Azardirachta indica*).
- g. *Others* : Sesame and Groundnut oil, Gur, Salt.

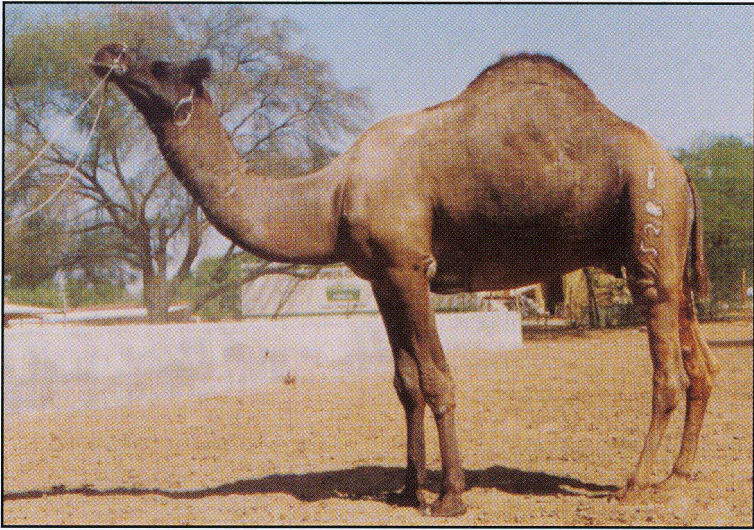
8. Housing

- a. *During nights only* : Mostly
- b. *Day and night* : None
- c. *Housed in kutchha* : Mostly
- d. *Housed in puckka* : None
- e. *Open house* : Mostly
- f. *Closed type house* : None
- g. *Peak summer days* : Shady trees

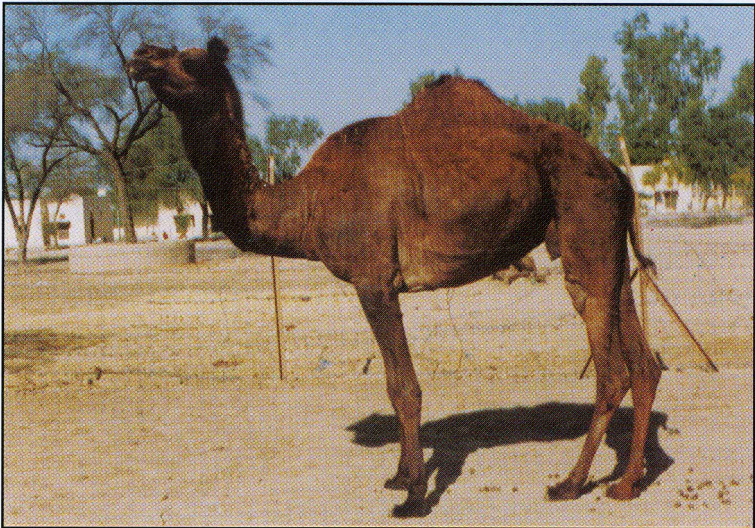
9. **Mating method** : Natural service only Breeding season (December to February)

B. PHYSICAL CHARACTERISTICS

	Male	Female
1. Coat color		
a. Light brown (%)	00.00	00.00
b. Brown (%)	50.00	38.09
c. Deep Brown (%)	33.33	16.66
d. Black (%)	28.57	33.33
2. Hair color		
a. Light brown (%)	05.55	00.00
b. Brown (%)	33.33	38.09
c. Red/Deep Brown (%)	33.33	38.09
d. Black (%)	27.27	23.80
3. Hair on ears and eye lids (Jheepra)		
a. Absent (%)	22.23	28.59
b. Prominent (%)	55.55	61.89



BIKANERI MALE



BIKANERI FEMALE

c. Very Prominent (%) : 22.22 09.52

4. Head

i. Size

a. Small (%) : 10.44 10.51

b. Medium (%) : 13.54 32.87

c. Large (%) : 76.02 56.62

ii. Stop (Well marked depression above the eyes)

a. Absent (%) : 06.27 09.52

b. Prominent (%) : 71.51 85.72

c. Very Prominent (%) : 22.22 04.76

iii. Fore head (Frontal bone)

a. Normal (%) : 04.72 11.03

b. Prominent (%) : 95.28 88.97

iv. Supra-orbital fossa : Prominent Prominent

v. Muzzle

a. Type : Normal Normal

b. Lips : Normal Normal

5. Chest pad : Developed Developed

6. Type of neck

a. Thin and Long (%) : 14.02 09.52

b. Thin and Short (%) : 04.32 04.76

c. Thick and Long (%) : 65.48 66.66

d. Thick and short (%) : 16.18 19.40

7. Udder

a. Shape : - Round

b. Teat shape : - Conical/ Round

8. Temperament

a. Dull (%) : 11.11 09.52

b. Active (%) : 88.88 90.47

9. Body measurements, Adult (in cm)

a. Heart girth : 216.49 204.74

b. Body length : 162.41 150.72

c. Height up to wither : 200.16 190.58

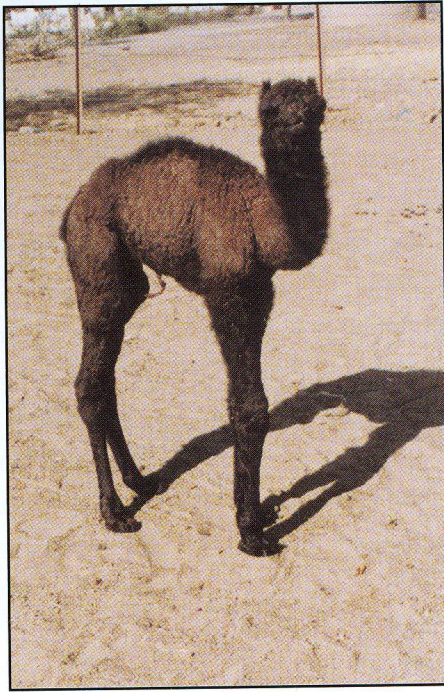
d. Length of tail	:	56.03	53.07
e. Neck length	:	118.16	108.58
f. Distance between eyes	:	25.44	21.91
g. Length of ears	:	12.81	12.05
h. Distance between ears	:	19.59	17.23
i. Length of face	:	56.06	50.61
j. Circumference of hump (H/V):		121.91/55.56	110.58/47.05
k. Length of fore leg	:	144.17	138.16
l. Length of hind leg	:	153.19	144.97
m. Foot pad			
a. Fore	:	18.87/19.97	18.27/18.48
b. Hind	:	16.72/18.41	15.96/16.64

10. Body weight (Kg)

a. At birth	:	38.29	37.68
b. At 3 month age	:	96.27	98.15
c. At 6 months age	:	151.05	158.73
d. At 9 months age	:	183.70	191.68
e. At 12 months age	:	204.68	218.04
f. At 15 months age	:	218.33	242.12
g. At 18 months age	:	227.33	247.35
h. At 21 months age	:	257.09	265.10
i. At 24 months age	:	267.27	275.06
j. At 30 months age	:	289.91	303.80
k. At 36 months age	:	323.81	332.51
l. At 48 months age	:	378.78	318.52
m. Adult body weight	:	670.00	556.00

C. PERFORMANCE

1. Draught	:	Good	Good (Generally not preferred for carting)
2. Dairy performance			
a. Daily milk yield (liters)	:	-	3.99±0.24
b. Milk composition	:		
Moisture	:	-	89-91%



BIKANERI CAMEL CALF



BLANKET

<i>Total Solids</i>	:	-	8-11%
<i>Fat</i>	:	-	1.5-3.1%
<i>Solid Not Fat (SNF)</i>	:	-	7-8%
<i>Protein</i>	:	-	2.1-2.5%
<i>Lactose</i>	:	-	3.8-4.3%
<i>pH</i>	:	-	6.3-6.6%
c. <i>Lactation length</i>	:	-	14-16 months
3. <i>Hair production (gm)</i>	:	1014.08±26.36	853.63±20.61

D. REPRODUCTION

1. <i>Age at puberty</i>	:	4 years	4.5-5 years
2. <i>Age at first estrus</i>	:	-	5-5.5 years
3. <i>Age at first mating</i>	:	6-6.5 years	5-5.5 years
4. <i>Age at first calving - Field</i>	:	-	6-6.5 years
- <i>Farm</i>	:	-	1765.27 days
5. <i>Calving interval - Field</i>	:	-	2 years
- <i>Farm</i>	:	-	740.76 days
6. <i>Average gestation</i>	:	-	388.30 days

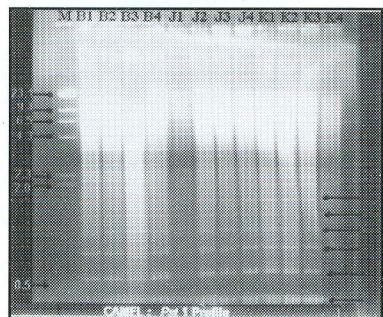
MOLECULAR GENETICS

CHROMOSOME PROFILE

The diploid count of chromosome in Bikaneri breed is 74. The entire chromosome complement consists of 25 pairs of sub-acrocentric, 5 pairs of sub-metacentric, 6 pairs of true acrocentric and one pair of sex chromosomes.

SATELLITE DNA

The satellite DNA analysis of Bikaneri camels with restriction enzymes *Hind* III, *Pst* I and *Pvu*II revealed that camel probably has higher equimolar concentration of repetitive DNA in its genome with internal periodicity of about 100-200 bp.

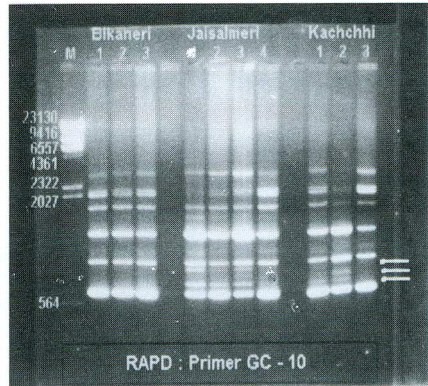


Leastsquares Mean of Body Measurements of Bikaneri Camel

Traits	Age Group									
	≤ 1 Year		2 Year		3 Year		4 Year		≥ 5 Year	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Heart Girth	139.9 ± 6.54	135.81 ± 5.90	165.55 ± 5.56	172.75 ± 8.34	183.10 ± 7.46	185.78 ± 7.86	188.67 ± 7.86	189.36 ± 7.11	216.47 ± 4.17	204.74 ± 2.62
Body length	105.46 ± 4.18	112.56 ± 3.76	123.61 ± 3.55	127.25 ± 5.32	133.20 ± 4.76	138.44 ± 5.02	142.11 ± 5.02	134.45 ± 4.54	162.41 ± 2.66	150.72 ± 1.67
Height at wither	145.54 ± 4.34	151.63 ± 3.91	167.89 ± 3.69	165.63 ± 5.54	183.60 ± 4.95	181.33 ± 5.22	186.22 ± 5.22	180.64 ± 4.72	200.16 ± 2.77	190.58 ± 1.74
Tail length	40.54 ± 1.61	39.37 ± 1.45	46.50 ± 1.37	46.88 ± 2.05	49.10 ± 1.84	51.67 ± 1.93	49.67 ± 1.93	48.27 ± 1.75	56.03 ± 1.03	53.07 ± 0.64
Neck length	76.23 ± 3.63	83.31 ± 3.27	88.89 ± 3.09	91.38- ± 4.63	98.30 ± 4.14	96.00 ± 4.36	98.78 ± 4.36	97.00 ± 3.95	118.16 ± 2.31	108.58 ± 4.5
Face length	35.77 ± 1.28	37.06 ± 1.13	43.11 ± 1.07	43.75 ± 1.60	46.60 ± 1.43	46.44 ± 1.51	48.33 ± 1.51	47.36 ± 1.37	56.06 ± .080	50.61 ± 0.50
Between eyes	16.62 ± 0.85	17.19 ± 0.77	20.44 ± 0.72	20.50 ± 1.08	21.50 ± 0.97	19.44 ± 1.02	22.44 ± 1.02	21.09 ± 0.92	25.44 ± 0.54	21.91 ± 0.34
Between ears	12.85 ± 0.72	13.06 ± 0.65	15.28 ± 0.61	16.25 ± 0.92	16.60 ± 0.82	15.44 ± 0.87	17.11 ± 0.87	16.00 ± 0.79	19.59 ± 0.46	17.23 ± 0.29
Ear length	9.23 ± 0.45	10.31 ± 0.40	11.22 ± 0.38	11.50 ± 0.57	11.50 ± 0.51	11.56 ± 0.54	11.67 ± 0.54	11.09 ± 0.49	12.81 ± 0.29	12.05 ± 0.18
Hump circum (H)	72.46 ± 6.90	77.06 ± 6.22	77.33 ± 5.86	79.75 ± 8.79	86.20 ± 7.86	89.44 ± 8.29	98.44 ± 8.28	86.18 ± 7.50	121.91 ± 4.40	110.58 ± 2.76
Hump circum (V)	33.76 ± 8.63	34.25 ± 7.78	31.11 ± 7.34	32.50 ± 11.00	36.30 ± 9.84	38.22 ± 10.37	41.78 ± 10.37	73.09 ± 9.38	55.56 ± 10.37	47.05 ± 3.46
Leg length (F)	115.77 ± 2.48	117.31 ± 2.23	127.44 ± 2.11	130.00 ± 3.15	140.00 ± 2.82	134.67 ± 2.98	140.11 ± 2.98	130.18 ± 2.69	144.17 ± 1.58	138.16 ± 0.99
Leg length (H)	124.92 ± 2.59	153.19 ± 1.65	136.17 ± 2.20	126.43 ± 2.34	147.10 ± 2.96	135.75 ± 3.31	148.78 ± 3.12	144.22 ± 3.11	153.19 ± 1.65	144.96 ± 1.09
Foot pad Length (F)	11.23 ± 0.56	11.81 ± 0.50	14.00 ± 0.48	14.37 ± 0.71	16.00 ± 0.64	15.33 ± 0.67	16.33 ± 0.67	16.36 ± 0.61	18.87 ± 0.36	18.27 ± 0.22
Foot pad width (F)	12.92 ± 0.65	13.44 ± 0.59	15.22 ± 0.55	15.75 ± 0.83	17.60 ± 0.74	16.44 ± 0.78	17.89 ± 0.78	17.36 ± 0.71	19.97 ± 0.41	18.48 ± .26
Foot pad length(H)	10.38 ± 0.52	10.25 ± 0.47	12.28 ± 0.45	13.00 ± 0.67	13.80 ± 0.59	13.55 ± 0.63	14.55 ± 0.63	14.36 ± 0.57	16.72 ± 0.33	15.96 ± 0.21
Foot pad width(H)	12.00 ± 0.54	11.81 ± 0.48	13.67 ± 0.46	14.37 ± 0.69	15.50 ± 0.61	13.89 ± 0.69	15.67 ± 0.65	15.63 ± 0.58	18.40 ± 0.34	16.64 ± 0.21

PCR-RAPD

PCR-Random Amplification of Polymorphic DNA in Bikaneri camels resolved breed informative markers. Maximum genetic variability was found in Bikaneri ($W^f = 0.80 \pm 0.05$) followed by Kachchhi ($W^f = 0.84 \pm 0.06$) and Jaisalmeri ($W^f = 0.87 \pm 0.05$) breeds. Close genetic

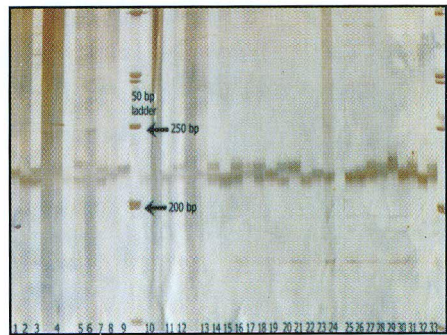


relationship between Bikaneri & Kachchhi ($D^f = 0.075$) followed by Jaisalmeri & Kachchhi ($D^f = 0.106$) and Bikaneri & Jaisalmeri ($D^f = 0.132$) was also observed.

MICROSATELLITE

The microsatellite marker study was carried out at 16 loci. 13 loci were polymorphic resolving two to seven alleles at a locus. YWLL-08

locus was most polymorphic. The expected heterozygosity ranged from 0.289 to 0.815. The polymorphic information content ranged from 0.267 to 0.789. This technique has the potential to make different clusters for different genetic groups



Photograph showing alleles at microsatellite locus (LCA-63) in Bikaneri camels

of a species. Initial results confirmed close genetic relationship between Bikaneri and Kachchhi breed.

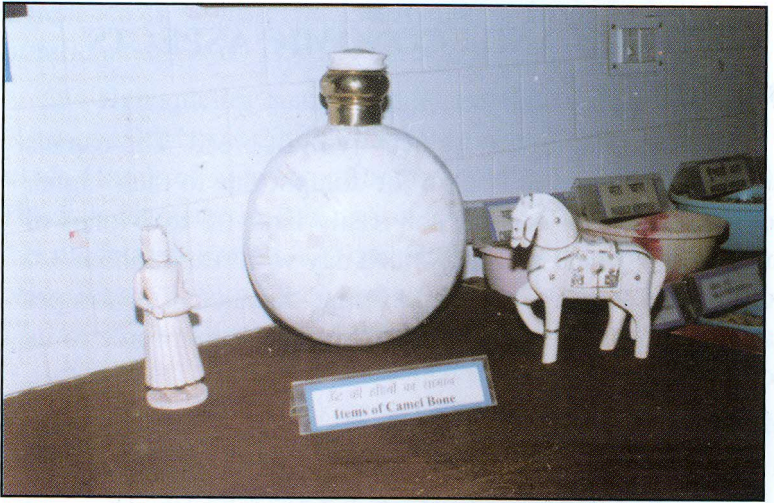
Amplification of micrisatellite loci in Bikaneri breed of camel using New World Camelidae primers.

Locus	Alleles(n)	Size (bp)	Temp(°C)	H _o	H _e	PIC
VOLP-03	5	145-168	64	0.43	0.741	0.675
VOLP-08	3	143-146	50	0.35	0.289	0.267
VOLP-10	5	250-265	55	0.68	0.715	0.624
VOLP-67	6	151-195	53	0.32	0.813	0.786
YWLL-08	7	132-162	55	0.94	0.815	0.789
YWLL-09	2	160-162	53	0.45	0.339	0.281
YWLL-38	3	180-186	55	0.63	0.545	0.440
YWLL-44	2	104-107	55	0.31	0.368	0.300
YWLL-58	3	173-177	51	1.00	0.619	0.547
YWLL-59	2	115-117	53	0.58	0.406	0.323
LCA-56	2	134-138	55	0.46	0.403	0.322
LCA-63	5	196-220	58	0.54	0.641	0.583
LCA-66	3	234-238	58	0.26	0.642	0.570
YWLL-29	1	208	55	-	-	-
YWLL-36	1	136	55	-	-	-
YWLL-40	1	173	55	-	-	-

H_o observed heterozygosity; H_e expected heterozygosity



Animal Genetics Laboratory



BONE GOODS



LEATHER GOODS

UTILITY AND ECONOMIC ASPECTS

DRAUGHT

It is a multipurpose heavily built breed. The camels of this breed are well known for draught due to their higher potential to carry loads. It can easily haul 1.5 to 2 tones of load on two-wheel cart for 8 hrs a day with rest of about 3-4 hours in between covering an average distance of 35 km per day. It produces about 17-22 percent of draught force to its body weight.

MILK

The camels of this breed is good in milk production with average daily production of 3.99 ± 0.24 liter/day and lactation length can continue up to 14 –16 months. The milk production indicates increasing trend up to 5th / 6th month of lactation with peak milk yield of about 6 liters per day and thereafter decreasing trend. Morning production is significantly higher than evening and production from rear teats is significantly higher than front teats. Milk production is about 10-26% higher under hand stripping method and allowing calf suckle stimulation as compared to machine milking and hand stripping of 4 teats. The total lactation yield worked out to be 1655.70 liters in 303 days. The camel milk is suitable for the preparation of tea and coffee. Preliminary trials have indicated beneficial effects of camel milk in the faster recovery of diabetes and tuberculosis. Milk is rich is vitamin C and some of the protective proteins.

HAIR PRODUCTION

The hair production data analysis indicates the annual hair production is 933.85 ± 17.99 gm with males producing 1014.08 ± 26.36 gm and females producing 853.63 ± 20.61 gm. Hair production is highest at 2-3 year of age and thereafter it has a decline trend. Males are superior then females and sex

difference is significant. Least squares analysis indicates significant effect of ($P < 0.01$) breed, sex, site and age.

Hair quality analysis indicates that staple length in Bikaneri is higher (6.27 ± 0.36 cm) than other breeds. The mean staple length of hair from hump region has highest length. The hair diameter in Bikaneri is lower (42.13 ± 1.37 μ) than the other two breeds i.e. Jaisalmeri and Kachchhi. The percentage of pure, hetero, hairy and kemp type hairs is 27.03 ± 1.17 , 46.06 ± 0.95 , 24.64 ± 1.10 and 2.30 ± 0.29 . Calf hair is superior in terms of hair diameter and presence of pure type hairs with minimum kemps. Comparison of percent fibre type indicates maximum percent of pure fibre (45.1%) indicating superior fine quality fibers from yearling calves. Camel hair is being used under village cottage industry by the camel keepers and weavers in making shawls, blankets, ropes, carpets and other items of daily use.

CAMEL CARTS

A good number of camel carts are being used in whole breeding tract for transportation of various goods (grains, fuel wood, fodder, construction material, water, LPG cylinders, etc.) A camel owner earns an average of Rs. 150 to 200 per day depending on the location.

SAFARI

Camels of Bikaneri breed are also used in camel safari. About 150-200 camels are being used for this purpose. A camel owner earns Rs. 100- 300 per day depending on the availability of tourists.

