

PRODUCTION, IMPROVEMENT AND STATUS OF



KACHCHHI BREED OF CAMEL



S.C. Mehta & K. M. L. Pathak



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(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
BIKANER - 334 001 (RAJASTHAN)



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FOREWORD

The camel continues to symbolise the height of traditional glory of Rajasthan and unpredictability of life in desert. This peculiar biodiversity of arid and semiarid regions of India has survived the torrents of change. Albeit, some threats to camel population are being witnessed owing to increasing urbanisation, yet its cultural and economic importance is gaining new momentum specially supported by camel's unique defence systems.

National Research Centre on Camel, Bikaner is entrusted with responsibility to undertake basic and applied research on the camel breeds of this country. The work on project "Genetic characterisation, evaluation and conservation of indigenous camel breeds" was focused to know the present status of the breed in the breeding tract but appreciable efforts have been made by the Project Investigator and his team to collect valuable information on production, utilization and characterisation of the breed in its native tract. The socio-economic conditions of the camel breeders of the tract along with the major health and management problems associated with the camel herds have been documented in the present publication.

I believe the information would be useful to field veterinarians, teachers, students, and camel breeders to know about the Kachchhi breed of camel and also for the policy makers, planner and researchers to prepare future strategies for its conservation and improvement.

K M L Pathak
K. M. L. Pathak
Director

PREFACE

Looking at those who have not been properly looked earlier is quite pleasing. The camels and their owners inhabiting the Banni land in the Kachchh district of Gujarat created an unforgettable picture in the mind. Camel as such serves human kind in places where the biological and geographical diversities are at their extremes. The camel sustains, produces and renders its services to man in hot and dry climate of desert, humid climate and marshy land of Kachchh and mild climate of hilly areas of Mewar. Thus the "Ship of Desert" i.e. the camel may better be re-named as the "Ship of Difficult Land"

Our country is rich in camel genetic resources. The camel population of the world is 19.32 million of which 0.632 million inhabits India. Among the Indian states, Rajasthan ranks first with a population of about 0.498 million and Gujarat ranks second with 0.053 million population. Characterisation, conservation and improvement of any livestock species or breed require proper documentation of the relevant information. Efforts were therefore directed to define the breeding tract and its environmental features, physically characterise the breed and evaluate the production potential of the breed in the breeding tract itself. The availability of the breeding males of the breed in a particular location and their distribution in the entire tract has also been envisaged. Suitable conservation and improvement strategies have also been devised.

I express my sincere thanks to the Director, National Research Centre on Camel, Bikaner for providing necessary guidance and to the Deputy Director, Animal Husbandry Department, Zila Panchayat, Bhuj for their kind cooperation in the execution of this task.



S.C. Mehta

KACHCHHI CAMEL

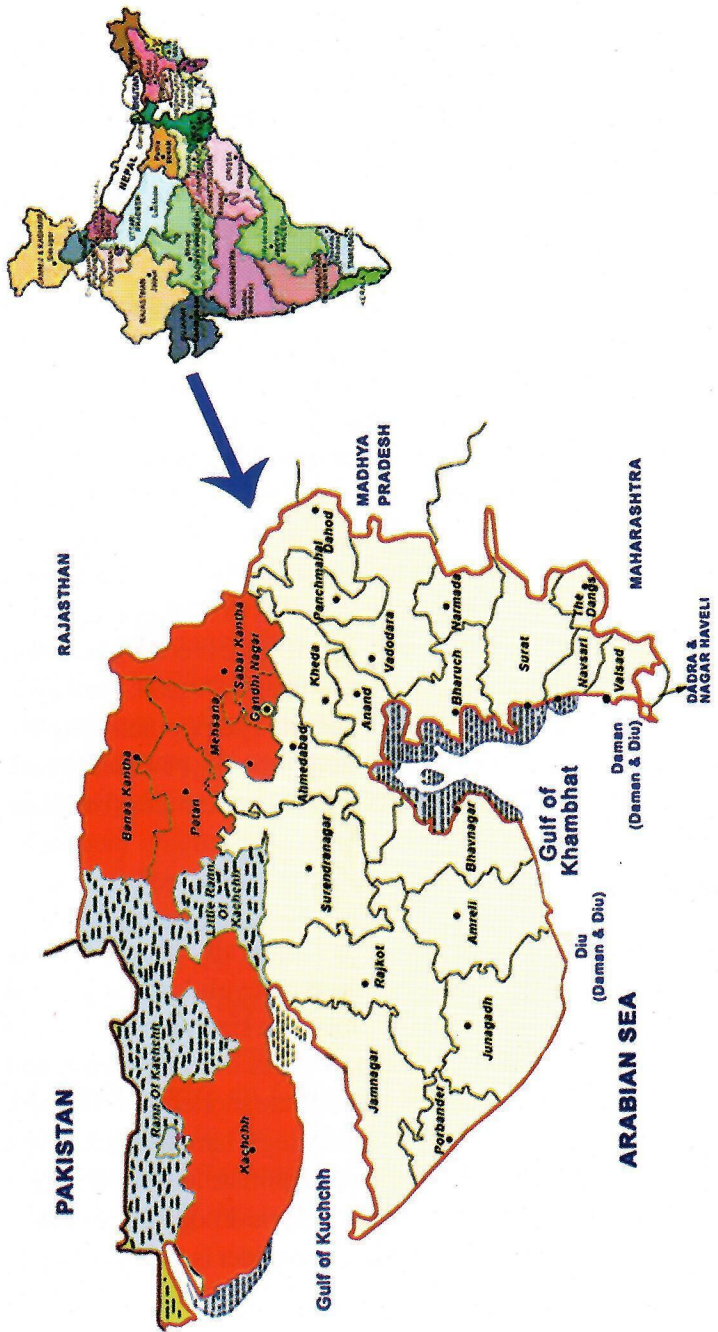
Kachchhi breed of camel is found in the Kachchh and Bansakantha districts of Gujarat. The breed derives its name from the region Kachchh where it is found in abundance. The Kachchhi breed is a multipurpose breed and the females are good milk producers.

Habitat and Distribution

The Kachchhi breed inhabits the *ran* of Kachchh in Gujarat state. The major breeding tract encompasses the Kachchh and Bansakantha districts of Gujarat and it extends in east from 68°20' to 74° longitude and in north from 22°51' to 24°37' latitude. The land is marshy with abundant salt bushes. The average height of Kachchh district from main sea level varies from 25 to 40 m. The average annual rain fall of Kachchh district is 326 mm with more than 75% relative humidity. The Banaskantha district is at little higher altitude with average annual rain fall of 544 mm and 60 to 65% relative humidity. Sizable population of the breed is also found in Patan, Mehsana, Sabarkantha, Gandhinagar, Anand, Jamnagar, Junagarh and Kheda districts of Gujarat. The population of the Kachchhi camels has been estimated to be 38,134 heads with 1048 breedable males and 23,560 breedable females (based on Livestock Census, 2003).

Features

The camels of this breed are generally brown to dark brown in colour with absence of hairs on eyelids and ears. The body hairs are coarse. Head is of medium size without distinct "stop". Body size is medium. Camels of this breed are heavy and dull in appearance. They are stouter and little shorter than Bikaneri. They have strong hindquarters, heavy legs, hard and thick foot pads and are well adapted to the humid climate and marshy land of Kachchh. In some animals the lower lip is droopy due to which the teeth are visible from a distance. The udder is well developed and mostly round in shape.



Breeding tract of Kachchi camel

BREED DESCRIPTOR

A. General Description

1. Name of the breed : **Kachchhi**
2. Local Names/Synonyms : Kachchhi
3. Species : Camel (*Camelus dromedarius*)
4. Background for such name : Named after the habitat- Kachchh
5. Since when breed is known : Since long
6. Communities responsible for breeding/rearing : Kachchhi Muslims and Rebaris are traditional breeders.
7. Native environment
 - a. Soil description : Marshy land with high salinity
 - b. Minimum-maximum temperature : 10-40°C
 - c. Relative humidity-Kachchh : >75%
Banaskantha : 60-65%
 - d. Annual rain fall - Kachchh : 326 mm
Banaskantha : 544 mm
8. Feed and Fodder
 - a. Bushes& Creepers : Unt phog (*Ephedra foliate Boiss*),
Lana (*Salsola baryosma Sehult*),
Bekario (*Indigofera cordifolium*),
Kali bui (*Heliotropium marifolium*),
Tumbo (*Citrullus colocynthis*),
Jal (*Salvadora oleiodes*) etc.
 - b. Trees : Guggal (*Commiphora species*),
Vilayati babool (*Prosopis juliflora*),
Suaeda fruticosa
 - c. Others : Sweet oil (Groundnut, Mustard)
and common salt.
9. Housing
 - a. No housing : Mostly
 - b. Housed in kutchha/ puckka : Some
10. Management
 - a. Semi-intensive (%) : 8.3
 - b. Extensive (%) : 91.7
11. Mating method : Natural service only

B. Physical Characteristics

	Male	Female
1. Coat color		
a. Very Light brown (%)	: 5	6
b. Light Brown (%)	: 46	49
c. Dark Brown (%)	: 49	45
2. Hair on ears and eye lids	: Absent	Absent
3. Hair length		
a. Small (%)	: 67	71
b. Medium (%)	: 28	22

c. Large (%)	: 5	7
4. Head		
i. Size		
a. Small (%)	: 6	10
b. Medium (%)	: 70	71
c. Large (%)	: 24	19
ii. Stop	: Absent	Absent
iii. Fore head	: Normal	Normal
iv. Supra-orbital fossa	: Normal	Normal
v. Muzzle		
a. Type	: Loose	Loose
b. Lips	: Droopy	Droopy
5. Body size		
a. Small (%)	: 15	20
b. Medium (%)	: 60	56
c. Large (%)	: 25	24
6. Chest pad	: Developed	Developed
7. Hump size		
a. Small (%)	: 7	13
b. Medium (%)	: 71	76
c. Large (%)	: 22	11
8. Udder	: -	Round
9. Teat	: -	Conical
10. Milk vein		
a. Medium (%)	: -	28
b. Large (%)	: -	72
11. Temperament		
a. Active (%)	: 9	12
b. Dull (%)	: 91	88
12. Biometry of Adults (in cm)		
a. Heart girth	: 211.00±4.24	207.87±1.11
b. Body length	: 168.67±3.90	161.34±1.09
c. Height at wither	: 197.83±2.96	194.09±0.75
d. Length of tail	: 56.83±1.54	53.32±0.39
e. Length of neck	: 105.00±2.72	103.59±0.69
f. Distance between eyes	: 27.51±0.87	24.58±0.22
g. Length of ears	: 11.67±4.58	9.25±1.16
h. Distance between ears	: 23.17±0.74	20.56±0.19
i. Length of face	: 62.00±1.37	52.94±0.35
j. Circumference of hump (H/V)	: 72.33/53.41	128.00/110.66
k. Length of fore leg	: 144.33±2.09	137.92±0.56
l. Length of hind leg	: 157.16±2.42	148.45±0.61
m. Foot pad (L/W)		
1. Fore	: 21.17/19.75	22.17/20.94
2. Hind	: 19.00/18.58	20.16/19.59
13. Growth (weight in Kg)		
a. At birth	: 37.65	37.54
b. At 3 month age	: 84.90	86.85

c. At 6 months age	: 149.65	157.51
d. At 9 months age	: 189.85	188.14
e. At 12 months age	: 213.00	211.41
f. At 15 months age	: 214.12	231.40
g. At 18 months age	: 249.66	245.73
h. At 21 months age	: 269.15	256.48
i. At 24 months age	: 274.25	277.50
j. At 27 months age	: 308.09	295.48
k. At 30 months age	: 312.62	294.00
l. At 33 months age	: 325.62	316.17
m. At 36 months age	: 352.34	338.97
n. At 48 months age	: 406.24	390.00
o. Adult body weight	: 593.91	518.93

Extent of Study

The study was carried out in two major camel rearing districts viz. Kachchh and Banaskantha of the Gujarat state. The camel herds of four tehsils i.e. Bhuj, Bhachau, Abdasa and Kankrej along with those of the two government farms were covered. Thirteen camel breeders, the staff of two government farms engaged in camel rearing, the officials attached to the government farms and the Deputy Director of the department were contacted for gathering information to know the present status of the Kachchhi breed in the breeding tract. Individual camels of the 15 herds were meticulously examined for the breed characteristics and in order to characterise the breed in the tract itself, biometry of 152 camels belonging to both the sexes and all age groups was done for 17 body parameters.

Status of Kachchhi camel in the breeding tract

Districts	Tehsils	Villages	Herds	Total Camels	Kachchhi		
					Total Camels	Breedable Male	Breedable Female
Kachchh	Bhuj	4	6	629	427	10	258
	Bhachau	1	2	170	160	5	101
	Abdasa	1	3	290	277	7	177
Banaskantha	Kankrej	2	4	110	56	2	34
Total - 2	4	8	15	1199	920	24	570

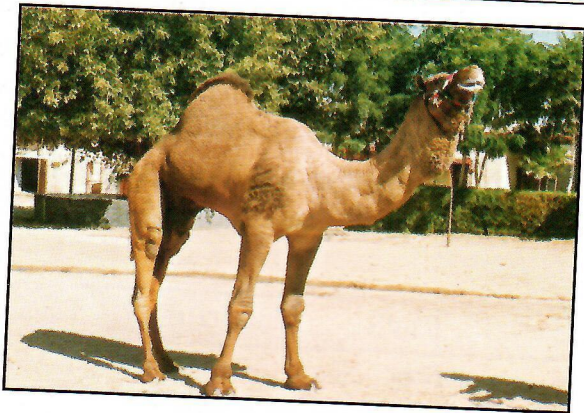
Body measurements of Kachchhi camel in the breeding tract
(in cm)

TRAITS	ADULTS	4 YEARS	3 YEARS	2 YEARS	1 YEAR
Heart girth	207.29±1.18	195.53±3.11	192.37±6.36	169.12±3.74	141.46±2.72
Body length	159.05±1.83	146.35±3.15	138.40±6.44	128.33±3.80	103.26±2.76
Height at wither	195.50±1.71	185.37±2.94	173.49±6.02	163.68±3.55	146.16±2.57
Length of tail	54.63±0.67	49.62±1.147	52.00±2.34	47.61±1.38	41.87±1.00
Length of neck	104.71±1.14	99.48±1.96	96.42±4.00	84.50±2.36	75.71±1.71
Length of face	53.48±0.40	49.75±1.01	44.50±2.01	39.91±1.22	37.14±0.88
Distance between eyes	24.76±0.22	23.20±0.56	22.51±1.13	21.55±0.68	19.62±0.49
Distance between ears	21.86±0.38	19.43±0.50	19.75±1.00	18.27±0.61	16.33±0.43
Length of ears	9.40±2.14	11.87±5.36	0.00±10.71	72.73±6.46	53.81±4.68
Circumference of hump (H)	54.55±1.40	45.81±3.42	51.75±6.84	39.45±4.13	38.00±3.01
Circumference of hump (V)	111.70±2.42	96.12±6.05	110.00±12.09	87.91±7.29	81.95±5.30
Length of fore leg	138.31±0.75	136.12±1.90	136.00±3.79	129.18±2.28	113.95±1.65
Length of hind leg	148.97±0.84	145.25±2.11	146.00±4.22	140.00±2.54	121.09±1.84
Length of foot pad (F)	19.84±0.18	18.31±0.46	18.50±0.92	15.09±0.55	14.33±0.40
Width of foot pad (F)	21.01±0.21	19.43±0.51	19.50±1.03	16.09±0.62	15.28±0.45
Length of foot pad (H)	18.61±0.18	17.31±0.44	17.50±0.88	15.45±0.53	14.24±0.38
Width of foot pad (H)	19.63±0.17	18.37±0.43	18.50±0.87	16.45±0.52	15.21±0.38

Socio-economic status

The average income of a camel breeder in the breeding tract is about Forty three thousand, which is higher than the average income of the camel breeders of other breeding tracts such as that of Jaisalmeri and Mewari. This income difference can be attributed to the difference in the average herd size which is significantly higher in the Kachchhi breeding tract as compared to the rest of the indigenous camel breeds.

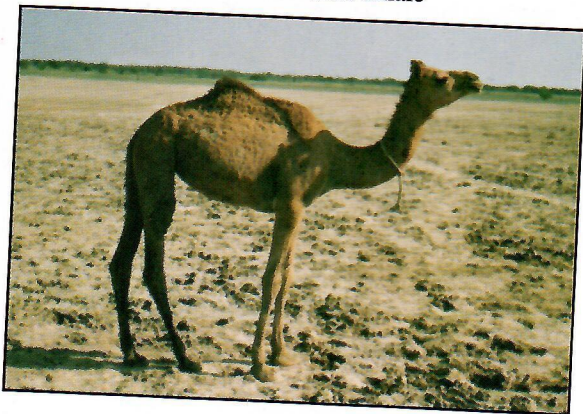
The family size of the camel breeders in this tract is also significantly higher than the breeding tracts of the other camel breeds, which is in contrast to the fact that Gujarat is one among the most developed and advanced state of this country. It was



Adult Kachchhi Male



Adult Kachchhi Female



Kachchhi Calf

also observed that the conditions in which the camel breeders are living in Kachchh district especially in the *Banni* land, are more primitive than other breeding tracts. The situation in Banaskantha district is much better and more similar to that of the other indigenous camel breeds.

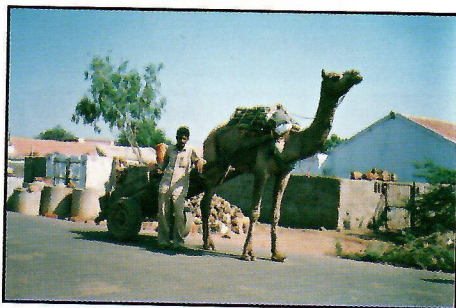
District and tehsil wise average annual income and family size

Districts	Tehsils	Income (Rs.)	Family Size
Kachchh	Bhuj	40000	9.8
	Bhachau	45000	9.0
	Abdasa	46667	8.7
Banaskantha	Kankrej	45000	7.0
Over all	4	43462	8.8

PRODUCTION AND REPRODUCTION

Draught

The Kachchhi camels are generally used as a baggage animal by the camel breeders for the transportation of their own house hold materials. The camel carts are also used in the tract but they are limited to the city areas. The Kachchhi camels have better draught potential than Jaisalmeri camels. The evaluation of draught potential of Indian camel breeds indicated that the Kachchhi camels at 20% of their body weight as draught (114.60 ± 3.04 kg) work for a period of 53.33 ± 1.67 minutes, cover a distance of 3.30 ± 0.00 km before exhaustion and generate 1.58 ± 0.07 horse power.



A small camel cart in Kachchh

Milk Production

Camel milk is the chief source of energy to the camel breeders in the breeding tract. Most of the breeders live with the herds in the tract itself and consume the camel milk as the main diet of the day. Most of them cook food (wheat preparations) only once a week. The she camels of this breed are good in milk production with average daily production of 3.94 ± 0.13 kg. The milk production was higher in 4 teat stripping than machine milking. The lactation length can continue up to 14 to 16 months. The camel milk on an average contains 89-91% moisture, 8.5-11.4% total solids, 1.5-3.1% fat, 7-8.3% solid not fat (SNF), 2.1-3.9% protein, 3.8-4.3% lactose and has 6.3-6.6 pH.

Hair Production

Camel hair is an indirect source of income to the breeders. It is mostly used for making some house hold goods, especially the blankets, carpets and ropes. In hair production, the Kachchi breed ranks at third position among the Indian camel breeds after Bikaneri and Jaisalmeri. The annual hair production has



Camel breeders making yarn of camel hair

been recorded as 623.22 ± 25.97 g with males producing 643.95 ± 39.91 g and females producing 602.50 ± 32.90 g. The analysis of hair quality attributes indicated 4.65 ± 0.42 cm staple length, 38.19 ± 1.07 μ hair diameter and the percent composition of different types of hair revealed 40.68 ± 1.28 % pure, 42.19 ± 1.08 % hetero, 14.99 ± 1.15 % hairy and 2.08 ± 0.34 % kemp type fibres.

Reproduction

An average Kachchhi female first conceives at an age of 1729 days and it gives birth to first young one at an age of 2259 days. The calving interval in this breed is about 746 days and the first gestation takes about 390 days and the subsequent gestations take 386 days. The males exhibit the symptoms of rut at an age of 5.5 to 6 years and can be used for regular breeding at the age of 6 to 6.5 years.

MANAGEMENT

Housing

Camels in the Kachchhi tract are kept in open. The extensive system of management is followed throughout the year. Providing natural shelters during extreme climatic conditions is possible but no housing is provided. Most of the camel breeders live with the camels under similar circumstances, especially in the *Banni* land. The scenario is little different in the Banaskantha district where semi-intensive type of management is also practiced.

Grazing

Most of the Kachchhi camels in the Kachchh district are kept under extensive system of management and the average daily grazing distance is about 10 to 12 km and the camels remain in the tract for 24 hours a day. The camels in Banaskantha district are mostly kept under semi-intensive system and the average daily grazing distance is 4-5 km and the grazing time is about 9 hours a day. The grazing distance and time also depend on the availability of the grazing land, work load and type of use.



Kachchhi camels in *Banni* land

District and tehsil wise grazing distance and grazing time

Districts	Tehsils	Grazing Distance (Km)	Grazing Time (Hr)
Kachchh	Bhuj	10.83	24
	Bhachau	10.00	24
	Abdasa	11.33	24
	Pooled	10.82	24
Banaskantha	Kankrej	4.75	09
Over all	4	9.20	20

Feed & Fodder

Camels in this tract feed mainly on Unt phog (*Ephedra foliate Boiss*), Guggal (*Commiphora species*), Lana (*Salsola baryosma Sehult*), Bekario (*Indigofera cordifolium*), Kali bui (*Heliotropium marifolium*), Tumbo (*Citrullus colocynthis*), Jal (*Salvadora oleiodes*) etc. The entire land is marshy and the climate is humid. Livestock in this tract also feed on the pods and seeds of *Prosopis juliflora* and the leaves of salt tolerant tree species *Suaeda fruticosa*.

Water

Palatable water is supplied in the *Banni* land through pipe line, which is consumed by both the camels and their owners. Also, the rain water is stored in tanks and is used for livestock.

Agriculture

None of the camel owner of Kachchh district covered under investigation had land. The land is not fertile and has lot of salinity. The land in Banaskantha district is relatively better than the Kachchh district. However, the crops like Wheat, Jowar, Bajra, Gram, Groundnut, Cotton, Mustard, Tobacco etc. are grown in the tract to some extent.

Health

The general health status of the camels in the Kachchhi tract is poor as compared to that of other camel breeds. This could be due to the availability of marshy land and high humidity in the tract. Mange and Trypanosomiasis are the major cause of worry to the breeders. The cases of diarrhoea, pneumonia, mastitis, abscess and wound are common. Most of the breeders go for allopathic prevention and treatment of Trypanosomiasis and Mange but for other diseases the firing at different body parts and other local treatments are in practice.

POPULATION ESTIMATES

Herd composition

An average herd in the tract consisted of about 80 camels of which 61 could be classified as Kachchhi. On an average 1.6 breedable males and 38 breedable females of the breed were available in a herd. The average herd size was higher in Kachchh district than the Banaskantha district. It was maximum in Bhuj tehsil followed by Bhachau, Abdasa and Kankrej tehsils. The average herd size in this tract is significantly higher as compared to the breeding tracts of other breeds. The extent of cross breeding in the Kachchh and Banaskantha districts was estimated to be 20.66 and 49.09 % respectively. The extent of crossbreeding pooled over districts was derived to be 23.27%.

Population

The population of Kachchhi camels in the breeding tract was estimated to be 38134 heads. The tract has 53246 camels. The population of the breedable males and females of the breed was estimated to be 1048 and 23560 camels respectively. The crossbreds were mainly of Kachchhi x Bikaneri.

Availability of breedable males and females of Kachchhi breed in a herd

Districts	Tehsil	Average Herd size	Kachchhi camels in an average herd		
			Kachchhi camels	Breedable	
				Males	Females
Kachchh	Bhuj	104.8	71.17	1.7	43.0
	Bhachau	85.0	80.00	2.5	50.5
	Abdasa	96.7	92.33	2.3	59.0
Banaskantha	Kankrej	27.5	14.00	0.5	08.5
Total	4	79.9	61.33	1.6	38.0

Population of Kachchhi camels in the breeding tract.

Districts	Camel population*	Kachchhi camels		
		Total	Breedable	
			Males	Females
Kachchh	10850	8608	220	5340
Banaskantha	11635	5923	212	3596
Other districts	30761	23603	616	14624
Over all	53246	38134	1048	23560

*as per Livestock Census 2003

MOLECULAR GENETICS

Chromosome Profile

The diploid count of chromosome in Kachchhi 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

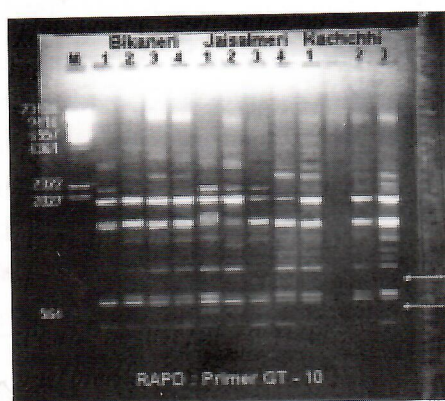
The satellite DNA analysis of Jaisalmeri camels with restriction enzymes *Hind* III, *Pst* I and *Pvu*II revealed that camel probably has higher equimolar concentration of repetitive DNA in its genome with internal periodicity of about 100-200 bp.

PCR-RAPD

PCR-Random Amplification of Polymorphic DNA was carried out using six random oligonucleotide primers. Reproducible polymorphic bands with varying frequencies among the three breeds of camel were obtained with five primers (GT-10, GC-10, G-2, OP-08 and G-1). A total of 75 bands were amplified, of which 27 (36%) were polymorphic. The 0.5 kb band in GT-10, 0.48 kb band in G-2 and 1.08 kb band in OP-08 were observed to exhibit probable specificity for Jaisalmeri breeds where as the

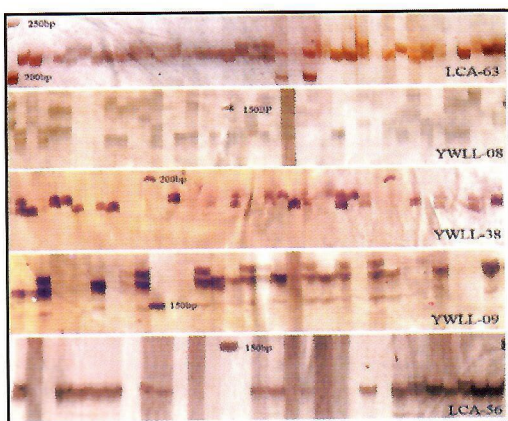
0.67 kb band in GT-10, 1.07 kb band in G-2 and 0.57 kb band in G-1, were observed to be of use in distinguishing the camel breeds. The band frequency estimates were superior to band sharing estimates in measuring the genetic relationship among camel breeds. The maximum genetic

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, which was observed to be mainly due to the differences in the herd size and population base of the breeds in the breeding tracts. 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 observed.



Microsatellite

Sixteen microsatellite loci were investigated for studying the genetic polymorphism in Kachchhi breed of camel. Polymerase chain reactions were carried out for 50 unrelated camels of Kachchhi breed. The amplification products were resolved in 6% (denaturing) urea PAGE and stained with silver nitrate. Out of sixteen microsatellite loci thirteen were found polymorphic in Kachchhi camels. The number of alleles ranged from 2 to 6. The expected heterozygosity ranged from 0.332



Microsatellite profile of Kachchhi breed

to 0.796. The polymorphic information content ranged from 0.277 to 0.765. The results indicated existence of enough genetic variation among dromedary individuals and the potential use of microsatellite markers for further genetic investigations including genetic diversity analysis, individual identification, parentage testing and production enhancement.

CONSERVATION AND IMPROVEMENT

The population of camels in the kachchhi tract has gone down by 18.62 % in five years (1997 to 2003) which is less than the overall reduction in the population of camel in this country (29.67%) and in the state of Rajasthan (25.61%), which is the chief state for camel rearing. Still the reduction rate in itself is alarming and proper steps must be taken for *in situ* conservation of the breed. Increasing the utility of the breed ultimately results in the conservation of the breed. Hence, better opportunity may be provided to the camel owners to sale the camel milk in the

market. A situation like *Mewar* will increase the economic returns to the breeders. The camel owners generally sale the males and most of them do not prefer to sale females. In general, the camel breeders select a male calf from their own herd and subsequently use the same for breeding. It will be better if they exchange the sires every four or five years. There are two government farms in the breeding tract of Kachchhi breed. The one at Dhori in Kachchh district and the other at Mota Jampura in the Banaskantha district. The camels of Dhori farm are reared under extensive system in most similar manner to that of the other camel breeders and they maintain about 350 camels whereas the farm at Mota Jampura has about 40 camels and they are kept under semi-intensive system. These two government farms along with the research institutions can play a major role in the selection of camels for milk production and other parameters, distribution of studs and evaluation of genetic improvement in all strata of the Kachchhi breeding tract.

