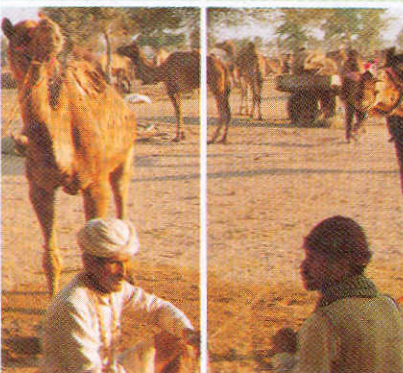
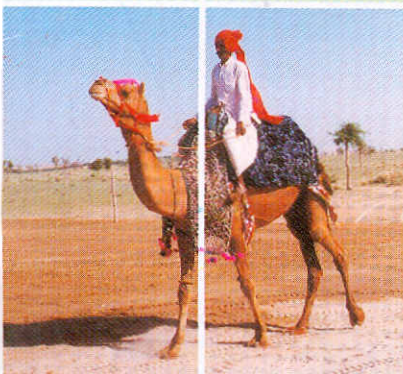




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Annual Report
1997-98



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ANNUAL REPORT 1997-98



(Estd. 5th July, 1984)

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PREFACE

I have great pleasure in presenting the Annual Report (1997-98) of National Research Centre on Camel (NRCC), Bikaner during the Golden Jubilee year of Independence of our country, which depicts panorama of the research programme and achievements of the centre under the indentified areas. As in the past, the centre conducted research on different aspects with an objective to improve the overall efficiency of camel through basic and applied research. We have opportunity of working in close collaborations with national and international agencies in achieving the mandate. Two new research programmes on race camels and medicinal utility of camel milk were taken up as a part of major programmes.

During the period under report, spectacular development has been made by the centre on various aspects like infrastructure development, camel museum, maintaining close linkages with SAUs, farmers and human resource upgradation. During the year the centre has also brought out new brochures and a large scale Kishan Mela was organised at the centre.

We are in process of strengthening our research through the National Agricultural Technology Projects.

I would also like to express my gratitude to Dr. M.L. Madan, Deputy Director General (Animal Science) ICAR, Dr. Arun Varma, Assistant Director General (AN&P) and Dr. N.D. Khanna, Ex-Director NRCC for their regular guidance and encouragement.

I wish to compliment with appreciation of all Scientists, Technical Officers, Publication Committee, Incharge Technical Cell and Computer Unit, who have put their efforts in the compilation, edition and preparation of Annual report.

I look forward to valuable suggestions and comments for further upgrading of our research performance during the years ahead.



(M.S. Sahani)

Director

EXECUTIVE SUMMARY

During 1997-98 the sanctioned staff strength of the centre was 75 and the staff in position was 66 consisting of one RMP, 12 Scientific, 21 Technical, 10 Administrative and 22 supporting.

The budget allocation under Plan was Rs. 100.0 lakhs and under Non-Plan was Rs. 54.0 lakhs which were fully utilised.

The farm herd strength at the beginning and close of year was 234 and 252 camels comprising mainly of Bikaneri, Jaisalmeri, Kachchhi and few cross-breeds (Arabi x Bikaneri camels).

Research:

Race endurance in 3 Bikaneri she camels was studied. The race performance was measured on 1.0 km. *kachha* track. The maximum race speed was recorded 8.25 meter/second. The cardinal physiological responses were recorded and blood samples were collected before and after the race. The respiratory frequency and pulse rate during exercise indicated significant increase. The level of glucose and lactate also increased whereas creatinine kinase and lactate dehydrogenase activity decreased. The feed intake, nutrient utilisation and mineral absorption was observed to be higher during exercise as compared to resting stage.

The comparison of birth weight of camel calves in three indigenous breeds (Bikaneri, Jaisalmeri and Kachchhi) indicated significant contribution of breed, year and sex effects. Bikaneri calves were heavier at birth as compared to other breeds. Genetic parameter viz. heritability of body weights upto 12 months age were estimated.

Average daily milk production of lactating Bikaneri and Jaisalmeri camels indicated good potential with average daily production of 4.9 and 4.7 l/day under ad lib feeding of moth chara (*Phaseolus aconitifolius*) with hand stripping. The contribution of time of milking and parity was observed to be significant. The early and late lactation of milk fat, SNF and vitamin C content indicated significant difference.

Hair quality traits in 18 yearling calves of Bikaneri, Jaisalmeri and Kachchhi breeds were studied. The fibre diameter at four different sites ranged from 20.5 ± 0.80 to 27.7 ± 1.06 micron. Neck and mid side region fibres were comparatively finer than hump and shoulder region. The quality traits indicated scope for utility of camel fibre with other animal/synthetic fibres.

Bio-chemical polymorphism studies conducted in three indigenous breeds and crossbred group. The camels were screened for haemoglobin, transferrin amylase, alkaline phosphatase, acid phosphatase, lactate dehydrogenase using both starch gel and polyacrylamide gel electrophoresis. None of the technique exhibited any polymorphism.

Survey of management practices being followed in villages of Bikaner and Jaisalmer districts indicated that extensive system of management is adopted by 6.6% farmers, intensive 35.2% and semi intensive system by about 58.2% farmers. The herd structure in two districts showed that 17.3% camels are below 1 year, 27.7% between 1 to 4 years and about 55.0% camels above 5 years of age.

Studies on objectives of camel rearing indicated that 56.1% farmers maintain camel for carting followed 25.5% for trade, 12.2% ploughing and only 1.0% for riding. Percentage carting in Bikaner and Jaisalmer district was 60.6% and 44.4% respectively.

The effect of nitrogen replacement by urea molasses and mineral block in ration of grazing camels (1.5 year age) did not show any significant advantage in terms of digestibility co-efficients of proximate principles nutrient and water intake.

Effect of supplementation of concentrate to studs during breeding season at the rate of 2.0 kg/day indicated increase in DMI intake and dry matter digestibility by 13.8% percent.

The sequential examination of ovaries by rectal palpation and ultra sound scanning during off season breeding under semi-intensive system of management indicated follicular presence during July/August month. The new born calf survival was not affected when calves were reared under shady places during day time.

Under the scheme of Development of Embryo Transfer Technology in Camel sponsored by Department of Biotechnology, the technique of non surgical collection of embryo was used with the help of two way long Foleys catheter. Among various hormonal protocols tried for super ovulation the super OV protocol gave best results. Out of 5 embryo transferred in recipients having +1 day synchronisation two she camels got conceived.

Under network programme on crop based Animal Production System, comparative grazing trial on pregnant and dry camels was carried out on sewan (*Lasirus indicus*) pasture and 3 tier grazing management system. The camels were grazed for 7 hour/day. Both the system indicated gain in weight upto September month and there after decline. The decline in weight was higher under sewan pasture grazing as compared to dry camels in 3 tier system. The growth of sewan pasture was poor due to irratic trend in rain fall.

The behaviour study during 7 hour grazing indicated that most of time 68.0% is spent for grazing. Forage preference and biting behaviour pattern revealed that camels preferred sewan grass by 56.0%, Ganthia grass 33.0% while in 3 tier system utilization of Ganthia was 54.0% and Pala (*Zizyphus nummularia*) 21.0% and rest other grasses.

Evaluation and conservation of Double Humped Camel scheme in cold desert was conducted in collaboration with FRL-DET Partapur (Ladakh). The construction of sheds and enclosures work was completed. The equipment Ermascope and Electronic Weigh bridge were purchased

as per the programme. Blood and hair samples were collected and screened for biochemical and fibre quality traits. The percentage of pure fibre ranged from 70.0% to 73.3% and average fibre diameter was 26.069 micron.

EXTENSION AND TRAINING:

One Kissan Mela and two Kissan Gosthies and exhibition were organised during the period. Six superior quality studs were distributed to progressive camel keepers belonging to different Panchayat Samities through State Animal Husbandry Department, Govt. of Rajasthan. Breeding input through elite Bikaneri studs was provided to about 250 she camels brought by camel keepers of near by villages during breeding season.

A short course of 2 weeks duration on "Camel Management and Health Care" was organised for field veterinarians, officers from Border Security Force and SAU's.

New Brochure on centre was released during the 50th years of Golden Jubilee Celebration of Independence.

A new museum was established at the centre depicting various research activities and salient achievements.

INFRASTRUCTURE:

Local Area Network (LAN) was created under ARIS. All laboratories and units were connected through computer network. A new electronic weigh bridge for weighing camel was installed.

□□

1. INTRODUCTION

1.1 HISTORY

The National Research Centre on Camel was established on 5th July, 1984. Prior to this, the Centre was known as Camel Breeding Farm under the aegis of College of Veterinary and Animal Science (RAU), Bikaner and before that with Department of Animal Husbandry, Government of Rajasthan. Over the years NRCC has developed modern laboratories and very good infrastructural facilities. The centre has generated large body of scientific data on various aspects in Indian camels.

The National Research Centre on Camel, Bikaner is located in the Jorbeer area at a distance of about 10 km from Bikaner city. The geographical location is 28.3° North Latitude and 73.5° East Longitude at MSL of 234.84m. The topography of the area is arid undulating desert with vast ranges of sand dunes. The soil type is mostly loose and sandy. The climate is mostly dry and hot with average annual rainfall of around 260-270 mm. The summer temperature ranges between 30°C to 45°C and winter temperature between 4°C and 28°C. National Research Centre of Camel, Bikaner, is having about 250 camels of different age groups mainly belonging to Bikaneri, Jaisalmeri and Kachchhi breeds.

1.2 PAST ACHIEVEMENTS

1. During this period NRC on Camel has developed an elite camel herd consisting of Bikaneri, Jaisalmeri and Kachchhi breeds.
2. Genetic Parameters have been estimated for several traits of economic importance.
3. Calf mortality brought down to 3-5% following improved management practices as against 20-30% in field condition.

4. Breeding efficiency of camel herd has been improved significantly in terms of age at first claving and calving interval.

5. Biochemical and haematological studies indicated almost negligible genetic variability in Indian dromedary camels. Random amplification of polymorphic DNA technique showed genetic variability in Indian dromedary camel.

6. Useful baseline data have been generated on draughtability, riding, ploughing capacity and fatigue index of Indian camel.

1.3 MANDATE :

1. To undertake basic and applied research for improvement of camel.
2. To act as a repository of information on camel research and development.
3. To provide leadership and co-ordinate camel research with state agricultural universities for generating location specific technologies.
4. To act as a centre for training in research methodologies specific to camels.
5. To collaborate with national and international agencies for camel research and development.
6. To provide consultancy.

1.4 INFRASTRUCTURE:

The NRC on Camel has a Camel farm unit, Research Laboratories, Range land, Residential complex and Guest House as a part of infrastructural facilities. The total area of NRCC campus is 824 ha.

1.4.1 Farm : The farm maintains an elite herd of about 250 camels comprising of Bikaneri Jaisalmeri and Kachchhi camels. The camel farm is equipped with one Camel Dispensary and a Disease Diagnostic Laboratory block, 6 roofed sheds, 3 camel boxes, 1 metabolic shed and a shed with provision for individual feeding. The farm also has fodder and feed godown, one experimental feed pelleting plant and a weigh bridge.

1.4.2 Laboratories : NRC on Camel has modern laboratories in 2 different complexes. One complex has laboratories for Camel Physiology, Camel Genetics, Camel Reproduction, Camel Health, Computer section and administrative wing. The other complex has Camel Nutrition and Camel Reproduction labs. The research unit has one seminar hall with 120-seat capacity.

1.4.3 Library : The library subscribes around 29 journals and other abstracting services. Photocopying facility is available in the library.

1.4.4 Rangeland : The NRC on Camel has 824 ha land partitioned in 5 blocks with 3 tube wells. About 650 ha of area has been fenced and 35 ha of land has been brought under perennial

silvipasture comprising of grasses, shrubs and trees. Main grasses are sewan (*Lasiurus indicus*) and Blue panic (*Panicum antidotale*).

1.4.5 Residential complex : NRC on Camel has residential colony comprising of 2 type V, 4 type IV, 5 type III, 9 type II and 13 type I staff quarters.

1.4.6 Guest house : The centre has one guest house with A/c and Non A/c rooms which can accommodate 8 guests.

1.5 STAFF POSITION :

The sanctioned strength in different categories at the centre was 65. All Positions were filled up. Category wise staff position are shown are shown in Table 1.5.1.

Table 1.5.1 Staff position during 1997-98

Staff categories	Positions		
	Sanctioned post	Filled	Vacant
R.M.P.	1	1	-
Scientific	20	12	8
Technical	-	-	-
Category III	4	4	-
Category II	7	6	1
Category I	11	11	-
Administrative	10	10	-
Supporting	22	22	-
Total	75	66	9

Names of the staff members in position during 1997-98

Director	:	Dr. M.S. Sahani
Scientific		
Senior Scientist (Anim. Gen. & Breeding)	:	Dr. S.N. Tandon
Scientist Sr. Scale (Animal Nutrition)	:	Dr. A.K. Nagpal
Scientist Sr. Scale (Animal Physiology)	:	Sh. A.K. Roy (On study leave)
Scientist (Animal Reproduction)	:	Dr. Sumant Vyas
Scientist (Animal Biochemistry)	:	Dr. Raghvendar Singh
Scientist (Animal Biochemistry)	:	Sh. Gorakh Mal
Scientist (Veterinary Parasitology)	:	Dr. R. Kumar (On study leave)
Scientist (Animal Gen. & Breed.)	:	Dr. B.P. Mishra
Scientist (Animal Biochemistry)	:	Miss Poonam Jayant
Scientist (LPM)	:	Dr. Champak Bhagat
Scientist (Veterinary Medicine)	:	Dr. Suchitra Sena
Scientist (Animal Nutrition)	:	Dr. Nirmal Saini
Technical		
Senior Veterinary Officer, T-8	:	Dr. U.K. Bissa
Live stock Farm Superintendent, T-7	:	Dr. N. Sharma
Farm manager (Agril), T-7	:	Sh. Ram Kumar
Veterinary Officer, T-6	:	Dr. B.L. Chirania
Library Asstt., T-4	:	Sh. Ram Dayal
Computer Opt/Prog, T-4	:	Sh. Dinesh Munjal
Agricultural Asstt., T-II-3	:	Sh. M.K. Rao
Lab. Techn., T-II-3	:	Sh. Anand Kumar Bhati
Hindi Translator, T-II-3	:	Sh. Nemi Chand
Jr. Engineer, T-II-3	:	Sh. Manjit Singh
	:	Sh. Mohan Singh
Livestock Asstt., T-1-3	:	Sh. Ram Chandra Bheel
Lab. Tech., T-2	:	Sh. Nand Kishore
Live Stock Assitant, T-2	:	Sh. Radha Kishan
Lab. Tech., T-1	:	Sh. Rameshwar Vyas
Drivers	:	Sh. Shivji Ram
	:	Sh. Prabhu Dayal
	:	Sh. Mehboob Hussain
	:	Sh. Rafiq Alam
	:	Sh. Mani Lal
Tube well Operators	:	Sh. Satnam Singh
	:	Sh. Suraj Bhan Singh

Administrative

Asstt. Adm. Officer	:	Sh. A.K. Mallick
Asstt. Finance & Accounts Officer	:	Sh. N.D. Sharma (On deputation)
Assistant	:	Sh. Kanwar Pal
Stenographer	:	Sh. Ram Kumar
Junior Stenographer	:	Sh. Harpal Singh
Senior Clerk	:	Sh. Ashok Yadav
Senior Clerk	:	Sh. Jamil Ahmed
Senior Clerk	:	Sh. Anil Kumar
Junior Clerk	:	Sh. Vishnu Kumar
Junior Clerk	:	Sh. K.K. Yadav

Supporting

SSG I To IV	:	22
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1.6 FINANCIAL STATEMENT

During the year 1997-98, Rs.100 lakhs were sanctioned under Plan and Rs. 54 lakhs under Non-plan. Full budget allocations were utilised. The statement of expenditure is provided in Table 1.6.1.

Table 1.6.1 Statement of expenditure

Head of Account	1996-97				1997-98			
	PLAN		NON PLAN		PLAN		NON PLAN	
	Budget	Expdt.	Budget	Expdt.	Budget	Expdt.	Budget	Expdt.
Estt. Charges	1.50	1.47	40.80	40.81	6.33	6.33	51.19	49.66
Wages	-	-	-	-	9.05	9.57	-	-
Assest acquired	-	-	-	-	0.50	0.35	0.46	0.46
Other Charges	59.75	59.95	4.00	2.77	63.80	62.89	2.35	0.35
Works	13.25	13.24	-	-	20.00	20.59		-
	75.00	75.00	45.40	44.15	100.00	99.73	54.00	50.47

2.

CAMEL HEALTH AND FARM MANAGEMENT

2.1 CLINICAL CASES :

During the period from April, 97 to March, 98, 167 cases of different ailments were treated belonging to camel farm of National Research Centre on Camel, Bikaner. Among the systemic diseases, 18 cases of digestive disorders, 2 cases of reproductive disorders, one case of respiratory disorder and others were of skin affections, surgical affections and others. Age, sex, and breed wise morbidity is presented in Table 2.1.1.

2.2 PROPHYLACTIC MEASURES

2.2.1. Control of trypanosomiasis : For prevention and control of trypanosomiasis chemoprophylaxis quinapyramine sulphate and chloride were injected twice in a year in the month of August-September and February-March. No case of surra was found in the herd during the year 1997-98.

2.2.2. Control of external parasites : The camels were sprayed with insecticides twice a year for prevention and control of ectoparasites after clipping of hairs in the month of March and second time after rains i.e. in the month of September-October. The sheds are also sprayed with insecticides.

2.2.3. Control of internal parasites : The camels are given broad spectrum anthelmintics twice a year in the month of September-October and March-April. But due to safe limit of intestinal parasitic infection (<50 epg) during month of February, hence March-April deworming schedule was not followed.

During the period one camp was organised at village Gadwala, where camels were treated for different ailments. The camels suffering from mange were also sprayed with insecticides by spray machine.

Table 2.1.1 Age, Sex and Breed wise morbidity during year 1997-98

	Sex		Age-Group				Breed				Total	Percent Morbidity
	Male	Female	0-3 months	3-36 months	Above 3 years	Bikaneri	Jaisalmeri	Kachchi	Cross bred			
(I) Digestive system												
(i) Diarrhoea	3	3	4	1	1	-	5	1	-	6	3.59	
(ii) Dyspepsia	1	9	1	1	8	3	1	5	1	10	5.99	
(iii) Impaction	-	1	-	-	1	1	-	-	-	1	0.59	
(iv) Stomatitis	1	-	-	-	1	-	1	-	-	1	0.59	
(II) Respiratory system												
(i) URI	1	-	-	-	1	-	-	1	-	1	0.59	
(III) Reproductive system												
(i) Abortions	-	1	-	-	1	1	-	-	-	1	0.59	
(ii) Vulvitis	-	1	-	-	1	1	-	-	-	1	0.59	
(IV) Skin Affections												
(i) Allergic Dermatitis	1	-	-	-	1	-	-	1	-	1	0.59	
(ii) Mange	50	22	15	3	54	35	25	8	4	72	43.11	
(V) Surgical Affections												
(i) Wounds/ Injuries	40	12	2	11	39	25	17	7	3	52	31.14	
(ii) Camel bite	4	-	-	1	3	2	1	1	-	4	2.39	
(iii) Leg Injury	1	-	-	-	1	-	1	-	-	1	0.59	
(iv) Lameness	1	-	-	1	-	1	-	-	-	1	0.59	
(v) Abscess	-	1	-	-	1	-	-	1	-	1	0.59	
(vi) Fracture	-	2	1	1	-	1	-	1	-	2	1.20	
(VI) Others												
(i) Pyrexia	3	3	1	3	2	2	2	1	1	6	3.59	
(ii) Poisenix	-	1	-	-	1	-	-	-	1	1	0.59	
(iii) Conjunctivitis	-	1	-	-	1	1	-	-	-	1	0.59	
(iv) Debility	-	3	-	1	2	3	-	-	-	3	1.79	
(v) Mastitis	-	1	-	-	1	-	1	-	-	1	0.59	
Total	106	61	24	23	120	76	54	27	10	167		

2.3 MORTALITY.

The specific death rate (SDR%) at the NRC on Camel, Bikaner was 3.90% during the year. The breed wise mortality in Bikaneri, Kachchhi, Jaisalmeri and Cross bred (Arab X Bikaneri) was 3.48%, 2.91%, 4.39% and 6.23% respectively. (Table 2.3.2). Age, sex and breed wise mortality per thousand camel days/day are presented in (Table 2.3.1)

Table 2.3.1 Age and Sex wise mortality during year 1997-98

Age groups	Sex	Camel days	No. of animals died	Mortality per 1000 camel days/day
Birth to 3 months	M	784	01	1.2755
	F	727		0.0000
	Pooled	1511	01	0.6618
3 Months to 3 years	M	9760	02	0.2049
	F	12471	02	0.1604
	Pooled	22231	04	0.1799
Above 3 years	M	20614	01	0.0485
	F	40594	04	0.0985
	Pooled	61208	05	0.0817
Pooled	M	31158	04	0.1284
	F	53792	06	0.1115
	Pooled	84950	10	0.1177

Table 2.3.2 Breed wise mortality during year 1997

Breeds	Camel days	No. of animals died	Mortality/1000 Camel days/day	SDR (%)
Bikaneri	39425	04	0.1014	3.48
Kachchhi	10989	01	0.9010	2.91
Jaisalmeri	29052	04	0.1377	4.39
Crossbred (AxB)	5484	01	0.1823	6.23
Overall	84950	10	0.1177	3.90

2.4 STUDIES ON PARASITIC DISEASES IN CAMEL

Blood samples were collected from apparently healthy and manged animals. The serum was separated and analysed for various constituents (Table 2.4.1). Among enzymes the activities of GPT, CPK and LDH were found to higher in group II. Blood picture revealed that the levels of Triglycerides, Urea, Glucose, Total protein and Globulin were higher in manged animals. However, no one could reach the level of significance except Triglycerides ($P = 0.01$). Calcium, Phosphorus, Magnesium and Chloride levels were found to be higher in group-II animals while reverse was true for Sodium, Potassium and Iron.

Blood samples were also collected by adding disodium EDTA @ 1 mg/ml for estimation of haematological parameters.

Haematological status (Table 2.4.2) revealed that in group II animals RBC, WBC, Hb, Neutrophils and Monocytes were significantly ($P < 0.01$) lower while, Lymphocytes numbers were significantly ($P < 0.01$) higher in group II animals.

Table 2.4.1. Level of enzymes and other constituents in the serum of camels

Parameters	Group-I (Normal)	Group-II (Manged)
ALP (IU/L)	79.89±10.24 (10)	62.73±9.90 (9)
GOT (IU/L)	76.97±6.49 (10)	63.74±3.26 (9)
GPT (IU/L)	7.72±1.51 (10)	9.04±0.72 (9)
CPK (IU/L)	36.24±6.20 (10)	43.91±7.01 (9)
LDH (IU/L)	765.19±56.05 (10)	847.86±68.98 (9)
Cholesterol (mg/dl)	24.17±4.12 (10)	24.25±3.88 (9)
Triglycerides (mg/dl)	11.57 ^A ±1.44 (10)	25.57 ^B ±4.73 (9)
Urea (mg/dl)	31.89±2.68 (10)	36.91±4.08 (9)

Creatinine (mg/dl)	2.14±0.23 (10)	1.95±0.22 (9)
Glucose (mg/dl)	92.34±7.73	108.51±9.35
Total protein (g/dl)	5.70±0.21 (10)	6.25±0.48 (9)
Albumin (g/dl)	3.62±0.25 (10)	3.20±0.31 (9)
Globulin (g/dl)	2.08±0.32 (10)	3.06±0.40 (9)
Calcium (mg/dl)	9.49±0.42 (10)	10.09±0.53 (9)
Phosphorus (mg/dl)	3.97±0.31 (10)	4.00±0.43 (9)
Chloride (mg/dl)	380.80±15.62 (10)	420.50±17.29 (9)
Magnesium (meq/l)	2.76±0.47 (10)	2.95±0.53 (9)
Sodium (meq/l)	153.78±3.79 (10)	147.78±0.92 (9)
Potassium (meq/l)	5.15±0.23 (10)	4.78±0.15 (9)
Iron mg/dl	79.91±17.01 (6)	62.98±11.42 (6)
Iron-binding capacity mg/dl	236.28±21.70 (6)	191.36±19.33 (6)

A,B - $P \leq 0.01$

Numbers With in brackets indicate the number of observations.

Table 2.4.2 Haematology of normal and mange camel

Parameters	Group-1 (Normal)	Group-II (Mange)
RBC (millions/cmm)	11.35 ^A ±0.23 (8)	8.48 ^B ±0.29 (10)
WBC (cmm)	9560.00 ^A ±634.4 (8)	5975.00 ^B ±341.50 (10)
Hb (gm%)	11.02 ^A ±0.49 (8)	7.95 ^B ±0.17 (10)
WBC differential (%)		
Neutrophils	47 ^A ±1 (6)	39 ^B ±2 (8)
Eosinophils	9 ^A ±1 (6)	11 ^B ±1 (8)
Lymphocytes	38 ^A ±2 (6)	46 ^B ±1 (8)
Monocytes	5 ^A ±1 (6)	2 ^B ±1 (8)
A,B -P<0.01 Numbers with in brackets indicate the number of observations		

3. RANGELAND MANAGEMENT

3.1. LAND RESOURCES

The range resources of the farm is spread over in 824 ha. The farm area is being fenced in phases and is divided in to 5 sectors. The developmental activities are mainly confined to fenced area of 125 ha. The land farm is undulated, alluvial with interdunal plains. Sand dunes of varying sizes both parabolic and longitudinal are present. The soil is predominantly sandy, light textured, loose structured and calcareous. The fencing work of the farm is in progress.

3.2 MAINTENANCE AND DEVELOPMENT

Old trees and pasture were maintained while performing requisite agricultural operations and applying necessary inputs. The plantation of about 3000 plant seedlings were undertaken among the rows of old trees. About 4 ha areas was incorporated with grasses like *Cenchrus ciliaris* and *Pennisetum pedicellatum* and range legumes like *Macroptilium atropurpureum*, *Stylosanthes species* and *Lablab Purpureus*. About 2 ha area was sown with rabi crops like Oat, Lucerne + chinese cabbage, which was being utilized by camels as a supplementary feed.

About 4000 plant seedlings of trees like Neem (*Azadirachata indica*), Siris (*Albizia lebbek*), Ardu (*Ailanthus excelsa*) and other ornamental components like Bougainvillea (*Bougainvillea spectabilis*) were introduced in farm area as well as in office cum residential complex.

About 7 hectares area of Blue panic (*Panicum antidotale*) pasture was extended through transplantation of rooted-slips in paddock No. 1 of farm are under NCP Scheme and in 2 km length thorn fencing around pasture was erected.

Lawn grass at various sites along with other landscaping components were being maintained and new ornamental seedlings were introduced. The 38 ha area was given on contract basis for the cultivation of irrigated and rainfed crops but could not be successful due to failure of contract. Farm area supported 6 hour regular grazing to a herd of about 200 camels of the centre under semi-intensive management system.



Camel grazing in the Rangeland Area of NRCC

4.

RESEARCH PROJECTS

4.1 TO STUDY WORK STANDARDS IN CAMEL AND TO ASSOCIATE WORK STANDARDS WITH PHYSICAL, PHYSIOLOGICAL AND BIOCHEMICAL PARAMETERS.

Project Code No.	PI 06/IICN/L-50/5220
Project Leader	Dr. Raghavender Singh
Associates	Dr. A.K. Nagpal Dr. M.S. Sahani Dr. N.D. Khanna

"Assesment of race standards with physical, physiological and biochemical parameters in Indian female camels."

The study was conducted on three female camels aged 6 to 8 years weighing 47.7 ± 16.7 kg. The camels were trained for race endurance for period of three months. Data on biometrical observations were recorded (Table 4.1.1)

The race performance was assessed on one km straight kachha desert track. The average environmental temp. during the race trail was $32 \pm 0.86^\circ\text{C}$. The maximum race speed was recorded 8.25 m/sec and experimental camels were targeted to race one km distance (middle distance race) at a stretch. The cardinal physiological responses were recorded and blood samples collected before and after race performance. The average respiratory frequency and pulse rate and rectal temp. before race was 7.66 ± 0.21 per min., 57.67 ± 1.36 per min and $37.08 \pm 0.04^\circ\text{C}$ respectively. The respiratory frequency and pulse rate on racing increased by 215% and 57% respectively (Table 4.1.2).

Data on different biochemical attributes is given in Table 4.1.3. The level of glucose and lactate increased significantly on racing. Increasing trend was observed in the level of triglycerides, however, it did not decline even after 24 hour rest. The creatine kinase activity and lactate dehydrogenase activity decreased significantly on racing whereas no significant change was observed in glutamyl transferase activity, cholesterol and urea.

Voluntary feed intake, nutrient utilization and serum profile of adult female camel during race and at rest.

Three adult female camels kept on sole roughage diet of dry month chara (*Phaseolus aconitifolius*) were initially adapted to exercise regimen of daily 1 km race at a speed of 30 km/h in the morning for 3 month, thereafter a 6 days digestibility trial during exercise was conducted. After a resting period of one week another 6 days digestibility trial on the same camels was conducted under stall feeding conditions. The digestibility coefficients, nutrient and water intake were observed to be higher in camels during exercise (Table 4.1.3). The apparent absorption of macro-minerals viz., Na, K, Ca, P and Mg was observed to increase during exercise that at rest. The serum values of K, P and Mg showed significant ($P < 0.05$) increase during exercise (Table 4.1.4). The results indicated that adult male camels during exercise should be given 94.62% more DCP and 55.30% more ME than at rest.

Sub Project : Identification, evaluation and selection of camels for race purpose.

Project Leader : Raghvendar Singh
Consultancy : Brig. N.M. Singhvi
Associate : Dr. M.S. Sahani

A total of 12 camels (six from Jaisalmeri and six from Bikaneri breed) in two groups of male and female were selected randomly in age group of 3-4 years. The details of their body weight and biometrical observation is given in Table 4.1.4. All the animals are going under training for muscle building and endurance and in the last phase, these animals will be put for racing for evaluation of race purpose.

Data on monthly body weight and initial biometrical observations are given in Table 4.1.4. The average body weight of Bikaneri males and females recorded were 399 ± 37.5 and 402 ± 18.0 respectively while for Jaisalmeri were 431 ± 34.2 and 391.26 respectively. Data on glucose, creatinine, CK, LDH, respiration/min and pulse/min of under training race animals at resting condition are given in Table 4.1.5. The average speed 15-20 km/h achieved during muscle building and endurance training. The race endurance trials will be conducted to increase the race speed.

Table 4.1.1 Biometrical parameter of female race camels.

Observation (Cm.)	Female camel no.		
	250	270	318
Leg length			
Fore	142	147	145
Hind	151	148	148
Body Length	152	148	152
Heart girth	210	203	212
Height at withers	192	201	192
Neck length	114	122	108
Circumference of the feet			
Fore	61	60	62
Hind	50	53	48
Body weight (K.g.)	464	456	510

Table 4.1.2 Cardinal physiological responses

Observation	Before race	After race	% Change
Blood Osmolity (mM/L)	316±1.76	342±5.71	8
Respiration/min.	7.66±0.21	24.17±0.70	215
Pulse/min	57.67±1.36	90.67±1.28	57
Rectal Temp. (°C)	37.08±0.04	38.38±0.07	03

Table 4.1.3 Biochemical attributes of female race camels

Particulars	Before race	After race	24 hour
Glucose (mg/dL)	66±6.08	130±19.66	57±6.09
T.G.(mg/dL)	41.86±3.23	60.63±4.82	53.15±4.68
Lactate (mg/dL)	1.92±0.18	14.69±0.63	2.02±0.21
Cholesterol (mg/dL)	26.33±1.41	24.33±1.41	27.30±0.72
Urea (mg/dL)	29±1.91	29±2.30	27±0.96
LDH (IU/L)	1028±25	842±42	1047±19
C.K. (IU/L)	165±15	112±17	197±6
V.G.T (TU/L)	17±0.65	16±0.30	16±0.85

a = Average ± SE of six observations.

Table 4.1.4 Monthly body weight and initial biometrical observation of racing camels.

Parameters	Bikaneri		Jaisalmeri	
	Male	Female	Male	Female
A. Body Weight (kg)				
December	293±10.9	324±2.5	353±32.8	316±4.9
Jan	302±10.00	324±13.8	366±41.4	381±0.58
Feb.	349±21.7	371±8.1	403±43.1	373±2.6
March	399±37.5	402±18.0	431±18.0	391±2.6
B. Biometry (cm.)				
a. Cannon Fore	18.7±0.66	18.5±0.33	19.3±0.33	18.7±0.17
Circumference Hind	18.7±0.32	17.5±0.29	18.3±0.33	17.6±0.17
b. Body length	130±4.36	134±2.33	137±3.53	138±4.18
c. Heart grith	183±1.86	180±2.33	191±5.33	178±0.58
d. Height at withers	195±3.53	187±5.24	195±6.33	187±1.15
e. Neck length	104±2.33	110±2.33	110±2.65	99±2.08

Table 4.1.5 Physiological and Biochemical attributes during resting condition in camels under training for race purpose.

Parameters	Bikaneri		Jaisalmeri	
	Male	Female	Male	Female
Glucose (mg/dL)	80.0±1.16	86.6±2.64	82.8±3.46	83.6±3.81
Creatinine (mg/dL)	1.78±0.21	1.44±0.16	1.48±0.38	1.73±0.22
C.K. (IU/L)	102.9±32.16	90.7±49.9	90.2±30.0	72.7±17.2
LDH (IU/L)	992±18.9	842±63.39	868±78.12	833±28.28
Respiration/min	8±1.41	8±1.00	7.3±0.57	7.6±0.57
Pulse/ min	45±4.25	43.7±2.88	41±2.65	42.66±2.08
Mean ± SD of three animals				

4.2 Studies on quantitative and qualitative genetic parameters in Indian Camels

Project Code No.	:	P.I. 86/2-ICN/L-10/5220
Project Leader	:	M.S Sahani
Associates	:	N.D. Khanna (30.9.97) S.N. Tandon B.P. Mishra
Technical Assistance	:	U.K. Bissa Banamali Yadav

At the beginning of year the camel herd strength of NRCC farm was 234 and at the end of the year it was 252, comprising mainly of 3 indigenous breeds and cross bred (Arab x Bikaneri). The breedwise initial strength of Bikaneri, Jaisalmeri, Kachchhi, Marwari, Sanchori and cross breeds were 105, 82, 30, 1, 1 & 15 respectively and at the end of year in same order was 110, 90, 34, 1, 1 & 16 respectively (Table 4.2.1). Addition due to calving was 35 of which 57% male and 43% were female calves. During the year 6 superior quality breeding male camels were distributed at panchayat level through State Animal Husbandry Department. In all 11 camels died/euthanised.

QUANTITATIVE PARAMETERS

(a) **Body weights** : The breed and sex wise least squares means of body weights from birth to 48 month are presented in Table 4.2.2. The mean birth weight of Bikaneri, Jaisalmeri and Kachchhi calves were 38.06 ± 0.47 , 36.76 ± 0.61 and 35.40 ± 0.65 kg. respectively. The effect of breed, year and sex was significant ($P < 0.01$). The male calves were found to be heavier than the female calves. The average body weights at later age from 3 months to 42 months did not show any significant variation due to breed and sex. The heritability estimates for birth weight was 0.37 ± 0.25 , for 9 months was 0.25 ± 0.30 and for 12 months body weight it was 0.28 ± 0.25 (Table 4.2.3)

(b) **Average daily weight gain** : The average daily weight gain up to 6 months of age in all the 3 breeds indicated increasing trend then a declining pattern with the increase in age upto 12 months was observed (Table 4.2.4) in all three indigenous breeds.

Reproductive parameters : The precent conception, calving rate, gestation length and inter calving period in three breeds viz Bikaneri, Jaisalmeri and Kachchhi were estimated and presented in Table 4.2.5.

The percent Conception rate varied from 65% to 71% with over all average of 67.92% calving rate was 58.49%, the gestation length was 393.2 ± 1.43 days and calving interval was 734.7 ± 5.85 days. The percent conception was highest in Kachchhi animals where as gestation length was highest in Jaisalmeri animals (397.2 ± 2.25).

PRODUCTION PARAMETERS

(a) **Milk Production** : The average daily milk production in lactating camels of Bikaneri and Jaisalmeri breeds belonging to 2nd to 5th Parity was recorded (Table 4.2.6A). The milk production was recorded both morning and evening at 12 hrs interval using 2 teat milking (allowing calf to suckle simultaneously other two teats) and 4 teat milking (Table 4.2.6B). The average daily milk production was higher in Bikaneri camels 4.96 ± 0.14 l/day as compared to Jaisalmeri animals 4.7 ± 0.20 l/day. Similarly morning milk production was higher than evening, the differences were significant. The effect of parity was also significant and the she camels in the 4th parity indicated higher milk production as compared to 3rd and 5th parity.

(b) **Milk enzyme studies** : Twenty seven camel milk samples from three breeds viz Bikaneri, Jaisalmeri and crossbred (Arab x Bikaneri) were analysed for Glutamate Oxaloacetate Transaminase (GOT), Glutamate Pyruvate Transaminase (GPT), Glutamyl Protein were determined and presented in Table 4.2.7. Significant difference in GOT, GPT, ALP were observed.

(c) **Bio-Chemical Polymorphism Studies** : During the period under report 48 camels belonging to four genetic groups viz Bikaneri-22, Jaisalmeri-17, Kachchhi-06 and three cross-bred camels were screened for haemoglobin, transferrin, amylase, alkaline phosphatase acid phosphatase lactatate dehydrogenase, malate dehydrogenase, iso-citrate dehydrogenase and sorbitol dehydrogenase polymorphism using both starch gel and poly-acrylamide gel electrophoresis techniques.

(d) **Chemical and macro-mineral composition of camel milk** : The chemical and macro-mineral composition were studied in the early and late phase of lactation and are presented in Table 4.2.7. The Significant ($P < 0.01$) differences were observed for fat %, SNF % total solids and Vit-C content. The levels of Na, K, Ca, P and Mg were found to significantly higher ($P < 0.01$) in late phase of lactation.

(e) **Hair quality** : Hair quality attributes (staple length, mean fibre diameter and percent composition of different fibres) were studied in 18 yearling calves (*Camelus dromedarius*) comprising of 3 breeds viz. Bikaneri, Jaisalmeri and Kachchhi (Table 4.2.8) Bikaneri calves indicated significantly higher ($P < 0.01$) staple length than Jaisalmeri and Kachchhi calves which is also evident from the average annual hair production in 3 breeds. Hair fibre from hump region showed highest length followed by shoulder, mid side and neck region. Mean fibre diameter ranged from 20.5 ± 0.80 to 27.7 ± 1.06 micron. Neck and mid side region hair fibres are comparatively finer than shoulder and hump region. The percentage of pure fibre varied from 41.89 ± 1.57 to 48.06 ± 1.76 hetero 32.5 ± 1.38 to 35.7 ± 1.11 , hairy fibres 16.3 ± 1.17 to 20.6 ± 1.22 and kemp fibres 2.85 ± 0.36 to 4.48 ± 0.60 . The fibre quality characteristics of yearling dromedary camel calves indicated good potential for utility as blends with other animal and synthetic fibres.

Table. 4.2.1 Camel herd strength (1997-98)

Breed/Age	Opening		Calving		Total		Deaths		Disposal		Closing		Total
	M	F	M	F	M	F	M	F	M	F	M	F	
Bikaneri													
up to 3 months	3	5	8	5	11	10	-	-	-	-	11	10	21
3 - 12 months	7	12	-	-	7	12	-	1	-	-	7	11	18
1-3 years	9	3	-	-	9	3	-	-	-	-	9	3	12
Above 3 years	18	48	-	-	18	48	-	3	4	-	14	45	59
Total	37	68	8	5	45	73	-	4	4	-	41	69	110
Jaisalmeri													
up to 3 months	4	2	9	6	13	8	1	-	-	-	12	8	20
3 - 12 months	6	7	-	-	6	7	-	-	-	-	6	7	13
1-3 years	4	6	-	-	4	6	3	-	-	-	1	6	07
Above 3 years	18	35	-	-	18	35	1	-	2	-	15	35	50
Total	32	50	9	6	41	56	5	-	2	-	34	56	90
Kachchhi													
up to 3 months	1	1	3	2	4	3	-	-	-	-	4	3	07
3 - 12 months	3	3	-	-	3	3	-	1	-	-	3	2	05
1-3 years	2	2	-	-	2	2	-	-	-	-	2	2	04
Above 3 years	9	9	-	-	9	9	-	-	-	-	9	9	18
Total	15	15	3	2	18	17	-	1	-	-	18	16	34
Crossbred (Arab x Bikaneri)													
up to 3 months	-	3	-	2	-	5	-	-	-	-	-	5	05
3 - 12 months	1	-	-	-	1	-	-	-	-	-	1	-	01
1-3 years	-	-	-	-	-	-	-	-	-	-	-	-	-
Above 3 years	1	10	-	-	1	10	-	1	-	-	1	9	10
Total	2	13	-	2	2	15	-	1	-	-	2	14	16
Marwari (Adult)	1	-	-	-	1	-	-	-	-	-	1	-	01
Sanchori (Adult)	1	-	-	-	1	-	-	-	-	-	1	-	01
Over All Total	88	146	20	15	108	161	5	6	6	-	97	155	252

M-Male, F-Female

Table 4.2.2. Breed, age and sex wise Least squares means of body weights (kg) in Indian Camel breeds (1988-1997)

Body Weights	Bikaneri	Jaisalmeri	Kachchhi	Sex	
				Male	Female
Birth	38.06±0.47 (120)	36.76±0.61 (64)	35.40±0.65 (41)	37.51±0.46 (114)	36.08±0.47 (111)
3M	89.56±1.35 (97)	86.20±1.56 (51)	89.29±2.26 (26)	90.64±1.32 (90)	86.06±1.43 (84)
6M	147.99±1.51 (61)	144.08±1.87 (34)	141.78±1.85 (37)	146.22±1.34 (71)	143.02±1.56 (61)
9M	182.82±1.92 (60)	179.59±2.34 (37)	182.14±2.45 (37)	182.17±1.78 (68)	180.85±1.87 (66)
12M	203.78±2.26 (103)	196.89±2.71 (49)	200.60±2.92 (46)	202.16±2.14 (93)	198.68±2.24 (105)
18M	239.35±3.26 (93)	230.99±4.20 (39)	230.28±4.66 (41)	235.12±3.39 (73)	231.96±2.90 (100)
24M	267.93±3.48 (73)	263.62±3.76 (35)	257.93±4.47 (35)	262.08±3.12 (70)	264.25±3.43 (73)
30M	298.87±3.33 (64)	289.76±4.17 (26)	289.95±4.47 (32)	290.82±3.12 (56)	294.89±3.14 (68)
36M	324.48±3.47 (63)	319.01±4.61 (22)	324.15±4.91 (29)	325.67±3.35 (53)	319.42±3.54 (61)
42M	358.47±3.81 (53)	353.66±5.60 (24)	348.10±5.72 (26)	355.33±4.71 (38)	351.49±3.66 (65)
48M	394.25±6.64 (42)	378.05±8.69 (15)	383.42±8.74 (23)	385.75±6.93 (30)	384.73±6.21 (50)

Note - M- month

Figures in parentheses represent number of observations

Table 4.2.3. Mean body weights and their heritability values.

Parameter	Mean Weight (Kg.)	h^2
Birth Weight	37.41±0.33 (174)	0.37±0.25 (174)
3 Month	89.44±0.91 (152)	0.02±0.20 (152)
6 Month	147.36±0.94 (113)	0.01±0.25 (113)
9 Month	180.84±1.45 (108)	0.25±0.30 (108)
12 Month	201.87±1.43 (169)	0.28±0.25 (169)

Figure in parantheses indicates number of observations.

Table 4.2.4. Breed wise Least-squares means of average daily weight gain (g/day) in Indian camel breeds (Birth to 1 year age)

Breeds/ Pooled	Birth-3 months	3-6 months	6-9 months	9-12 months
Bikaner	610.50±0.17 (72)	615.97±0.20 (47)	429.84±0.24 (35)	230.00±0.26 (53)
Jaisalmer	570.96±0.21 (39)	623.27±0.24 (31)	391.15±0.33 (20)	205.34±0.30 (32)
Kachchhi	626.55±0.27 (21)	540.17±0.31 (18)	447.04±0.29 (30)	246.25±0.31 (32)
Pooled	602.67±0.15 (132)	593.14±0.16 (96)	422.68±0.19 (85)	227.29±0.20 (117)

Figure in parantheses indicates number of observations.

Table 4.2.5. Reproductive parameters of Camel herd.

Breed	Percent conception	Percent calving rate	Gestation length (days)	Calving interval (days)
Bikaneri	65.20	52.17	392.3±1.6 (11)	729.6±7.30 (08)
Jaisalmeri	69.57	60.87	397.2±2.25 (10)	732.3±1.0 (07)
Kachchhi	71.43	71.43	387.2±8.54 (5)	749.2±16.8 (04)
Pooled	67.92	58.49	393.2±1.43 (26)	734.7±5.85 (19)

Figure in parantheses indicates number of observations.

Table 4.2.6 A. Breedwise least squares means of daily milk production (l/day) in Indian Camel

	Morning	Evening	Total
Bikaneri	2.65±0.08 (134)	2.31±0.69 (134)	4.958±0.136 (134)
Jaisalmeri	2.52±0.11 (112)	2.27±0.10 (112)	4.790±0.197 (112)

Figure in parantheses indicates number of observations.

Table 4.2.6B. Milking technique and parity wise least squares means of daily milk production (l/day) in Indian camel

Milking technique	Morning	Evening	Total
2 teat striping	3.02±0.08 (121)	2.75±0.07 (121)	5.78±0.14 (121)
4 teat striping	2.15±0.78 (125)	1.82±0.07 (125)	3.97±0.14 (125)
Parity III	1.72±0.11 (72)	1.46±0.10 (72)	3.18±0.20 (72)
Parity IV	3.00±0.89 (85)	2.69±0.80 (85)	5.68±0.16 (85)
Parity V	2.60±0.14 (45)	2.45±0.13 (45)	5.05±0.25 (45)

Figure in parantheses indicates number of observations.

Table : 4.2.7. Chemical and Macro-mineral composition of camel milk.

Milk Components	Phase of lactation	
	Early (2-2.5 months)	Late (12-13 months)
pH	6.38 ^A +0.01(27)	6.58 ^B +0.03 (27)
Protein(%)	3.78+0.05 (27)	3.87+0.17(27)
Caesin (%)	2.90+0.04 (27)	3.01+0.14 (27)
Ash (%)	0.82 ^a +0.01 (27)	0.85 ^b +0.01 (27)
Fat (%)	2.49 ^A +0.11 (27)	3.10 ^B +0.15 (27)
SNF (%)	7.36 ^A +0.14 (27)	8.22 ^B +0.25 (27)
Total Solids	9.85 ^A +0.21 (27)	11.32 ^B +0.036 (27)
Vit-c (mg%)	5.18+0.36 (27)	4.84+0.20 (27)
Na (meq/l)	29.72 ^A +0.57 (30)	35.54 ^B +0.88 (30)
K (meq/l)	50.74 ^A +0.51 (27)	71.96 ^B +1.43 (30)
Ca (mg %)	94.10 ^A +0.73 (30)	97.43 ^B +0.56 (30)
P (mg %)	41.72 ^A +0.56 (30)	47.21 ^B +0.53 (30)
Mg (mg %)	11.88 ^A +0.20 (30)	13.59 ^B +0.32 (30)

A,B means P<0.01

a,b means P<0.05

Figures in parentheses indicate number of samples.

Table 4.2.8. Level of milk enzymes in Indian dromedary during late lactation

Parameters	Breeds		
	Bikaneri (9)	Jaisalmeri (9)	Cross bred (9)
GOT (IU/L)	9.21±1.51	7.98±0.87	140.50±1.88
GPT (IU/L)	9.49±1.59	11.00±1.40	10.89±1.52
VGT (IU/L)	254.00±19.89	296.00±20.13	348.00±58.18
ACP (IU/L)	3.08±0.46	2.74±0.34	2.73±0.37
ALP (IU/L)	24.93±2.52	16.04±1.93	16.19±2.21
LDH (IU/L)	132.00±29.42	168.00±42.25	148.00±41.27
Milk plasma Protein (g/dl)	1.25±0.16	1.38±0.11	1.52±0.14

4.3 To develop suitable management practices for rearing camel

Project code	:	P.I. 86/3-ICN/L-50/5220
Project Leader	:	S.N. Tandon
Associate	:	N.D. Khanna (upto 30.9.97)
Technical assistance	:	U.K. Bissa

Investigations on camel management systems viz. intensive, semi-intensive and extensive were studied in two districts of Rajasthan viz. Bikaner and Jaisalmer. A total 23 villages (17 from Bikaner and 6 from Jaisalmer districts) were selected and were further divided into irrigated and nonirrigated area. In all 196 farmers were interviewed for developing database on management practices followed in camel farming. List of the villages is presented in Table/Map 4.3.1.

Studies on camel herd strength indicated that most farmers in Bikaner district maintain upto 4 camels per family i.e. 59.9% and only 8.4% farmers are keeping more than 35 camels in their herd, whereas, in Jaisalmer district approximately 25.9% farmers maintains low number of camels (69.5% farmers maintain 1-4 camels). In non-irrigated area large number of farmers 61.6% maintains more than 5 camels in there herd (Table 4.3.2).

Data recorded on herd structure in two districts of Rajasthan indicated about 17.3% camels below 1 year, 27.7% between 1-4 years and about 55% camels above 5 years. The significant difference were observed in the sex ratio. The male animals in these area is only 30.5% whereas female animals 69.5% (Table 4.3.3).

The data generated on different management systems indicated that only 6.6% camels are managed under extensive system and 35.2% are managed on intensive system whereas most camels (58.2%) are managed under semi-intensive system of management. The farmers having 1 camel prefers intensive system of management (84.9%), whereas (89.2%) farmers maintainning more than 5 camels prefers semi-intensive system of management (Table 4.3.4).

Studies on objectives of camel rearing indicated that about 56.1% farmers maintain camel for carting followed by 25.5% for trade, 12.2%, ploughing and only 1% riding (Table 4.3.5). The carting was major objective in Bikaner district about 60.6% while in Jaisalmer districts it was 44.4%. Trade was main objective in Jaisalmer district 31.5%, which was 23.2% in Bikaner district. Pack loading was not a major objective in Bikaner whereas in Jaisalmer district 9.3% farmers utilises camels for pack loading as major objectives (Table 4.3.6).

Under the technology transfer Kisan Gosties were arranged in village Gadwala and 42 farmers attended the Gosties. The animals brought to the Gosti place as well as at the farmers door were treated for ailments.

An animal fair at Gogamedi was attended and studies were conducted to find out the status of camel. In all 51 randomly chosen farmers were interviewed. The random sampling indicated that animals brought for sale were less than 10% below the age of 3 years, and 91% above 3 years in age (Table 4.3.7).

Data on animal fair organised by the department of animal husbandry, Rajasthan, for the period 1991-97 (Table 4.3.8 and 4.3.9) was collected and analysis is in progress.

Figure 1
Location of investigated villages in Bikaner and Jaisalmer Districts

Scale 1:1,600,000

⊙ District chief town
● investigated village
underlined ; irrigated zone
Village list.

Bikaner District

1. Gadwala
2. Kesardesar
3. Ramsar
4. Kilchu
5. Lalasar
6. Morkhana
7. Geegasar
8. Surdhana
9. Pemasar
10. Husansar
11. Geersar
12. Khara
13. Kanasar
14. Tejpura
15. Modayat
16. Rasisar
17. Nada

Jaisalmer District

20. Ramgarh
21. Mohangarh
22. Nachna
23. Satiaya
24. Myajlar
25. Khuri

PAKISTAN

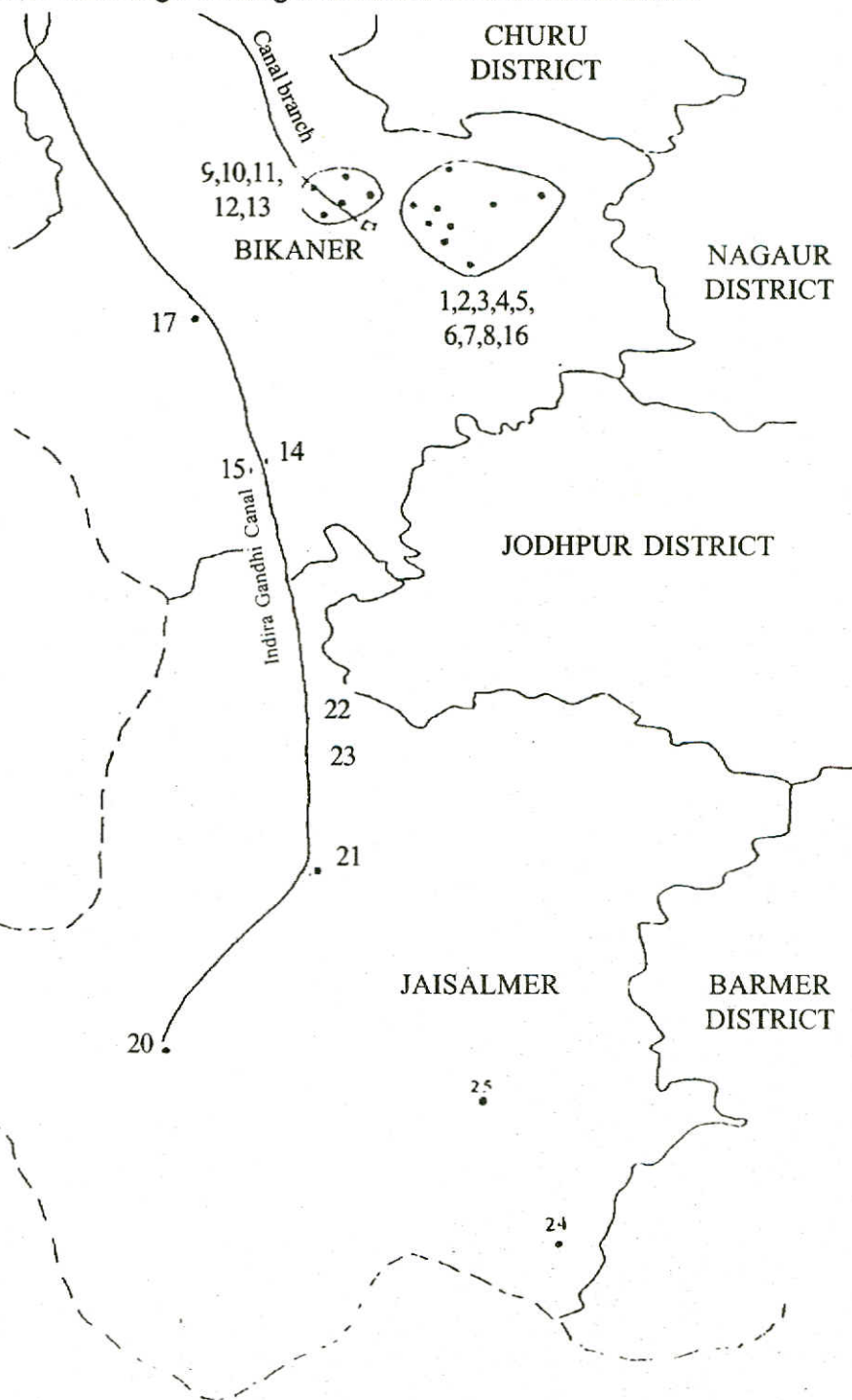


Table 4.3.2 Camel herd strength distribution

% of farmers owning	1 Camel	2-4 Camels	5-9 Camels	10-30 Camels	Over 35 Camels
In Bikaner District	31%	28.9%	16.9%	14.8%	8.4%
In Jaisalmer District	16.7%	14.8%	24.1%	18.5%	25.9%
In irrigated zones	40.2%	29.3%	15.8%	3.7%	11.0%
In non-irrigated zones	17.5%	21.9%	21.1%	25.6%	14.9%
Overall area	27.0%	25.0%	18.9%	15.8%	13.3%

Table 4.3.3 Camel herd structure in Rajasthan

	0 to 1 year old	1 to 4 years	More than 5 years	Total
Males	0.97±2.22 (7.77%)	1.42±3.32 (11.37%)	1.42±1.45 (11.37%)	3.81±5.84 (30.50%)
Females	1.19±2.60 (9.53%)	2.04±5.41 (16.33%)	5.45±9.46 (43.63%)	8.68±15.82 (69.50%)
Total	17.30%	27.70%	55.00%	100%

Table 4.3.4 Management systems followed by camel owners in Rajasthan

Herd strength	Pasturelands and forestlands only	Stall feeding only	Combination of both
1 Camel	0.0%	84.9%	15.1%
2-4 Camels	2.0%	44.9%	53.1%
5-9 Camels	5.4%	5.4%	89.2%
10-30 Camels	16.3%	0.0%	83.7%
More than 35 Camels	19.2%	0.0%	80.8%
Overall population	6.6%	35.2%	58.2%

Table 4.3.5 Objectives of camel rearing in Rajasthan

Objectives	
Trade	25.5%
Draft for cart	56.1%
Ploughing	12.2%
Pack loading	2.6%
Ride	1.0%
No objective	1.5%
Don't know	1.1%

Table 4.3.6 District and zone-wise camel rearing objectives

	Trade	Cart	Pack loading	Ploughing
Bikaner	23.2%	60.6%	0.0%	14.1%
Jaisalmer	31.5%	44.4%	9.3%	7.4%
Irrigated zone	11.0%	75.6%	1.2%	12.2%
Non irrigated zone	36.0%	42.1%	3.5%	12.3%

Table 4.3.7 Animals treated in adopted village (Gadwala)

Animals brought for Treatment	No. of animals	Disease/system Involved
Camels	17	Mange/wound/digestive disorder
Cows	04	Wound & temperature
Goats	02	Fracture/wound
Sheep	02	Wound/pyraxia
Buffelo	01	Wound

Table 4.3.8 Age group wise and Sexwise camel brought at Gogameri fair for sale

Sex/Age groups	3 years old	4 to 7 years old	Over 7 years old	Total
Males	3%	18%	26%	46%
Females	6%	12%	35%	54%
Total	9%	30%	61%	100%

Table 4.3.9 Camels rates at Gogameri fair

Sex /Age groups		3 years old	4 to 7 years old	Over 7 years oldTotal
Males	H	Rs. 7000	Rs. 11000	Rs. 15000
	L	Rs. 5000	Rs. 6000	Rs. 1750
Females	H	Rs. 12500	Rs. 13000	Rs. 15000
	L	Rs. 2000	Rs. 5000	Rs. 5500

H - Higher

L - Lowest

4.4 Studies on camel Nutrition

Project Leader : Dr. A.K. Nagpal

Associates : Sh. A.K. Roy

: Dr. M.S. Sahani

Experiment 1 Effect of replacement of urea molasses mineral block in the ration of camel calves

Eight growing camel calves (1.5 yrs, 212 kg) were divided into 2 groups of 4 each. Animals in group I were given groundnut (*Arachis hypogea*) guna ad. lib with 1 kg pellet concentrate while those in group II were given groundnut guna and 50% nitrogen of 1 kg pellet concentrate replaced by nitrogen of UMMB. The average daily gain (g/d) was higher in group I (0.426 ± 0.09) than in group II (0.350 ± 0.040). No statistical difference was observed in respect of digestibility coefficients of proximate principles, nutrients and water intake (Table 4.1.1). The apparent absorption of macro-minerals from GIT was positive except for Ca. Significant ($P < 0.05$) higher values of urea but lower ALT were observed in group II animals. Serum electrolytes viz., Na, K, Cl, Ca, P and Mg also did not differ significantly between two groups (Table 4.4.2). The results indicated the 50% nitrogen replacement from UMMB in the diet of camel calves is not advantageous from growth view point.

Experiment 2. Supplementation influence on nutrient utilization in adult male camels during rutting season

Six adult male camel studs were maintained on dry chaffed *Phaseolus aconitifolius* fodder during winter. The camel studs (3) in group I were daily given 2 Kg pellet concentrate supplement while those (3) in group II were given 0.5 l Til oil and 1.0 kg gur. Due to rutting, the average DMI was lower in all camels but supplementation increased DMI by 68% in group I (5.31 ± 0.17 kg/d) than in group II (3.16 ± 0.32 kg/d). Likewise supplementation also improved DM digestibility by 13.82% units in group II Further analysis is in progress.

Table 4.4.1 Growth, Digestibility coefficients, nutrient and water intake of camel calves

Parameters	Gp-1	Gp-2
GROWTH		
Initial B. Wt. Kg	215.25±17.89	209.00±15.17
Final B. Wt. Kg	250.00±20.03	232.75±16.17
B. Wt. Gain. Kg	33.25±6.82	23.75±2.93
ADG (g/d)	0.43±0.09	0.31±0.04
DMI Kg/d GN guna	3.99±0.21	3.88±0.16
Conc.	0.92±0.00	0.59±0.00
UMMB	-	0.31±0.00
Total	4.91±0.21	4.78±0.16
Digestibility (%)		
DM	58.85±2.68	59.13±1.15
OM	62.32±1.94	62.10±1.11
CP	60.99±2.07	64.61±1.08
EE	63.85±2.63	52.86±11.21
CF	39.43±4.05	40.23±3.22
NFE	71.99±1.62	72.00±0.62
Nutrient intake		
DCP (kg/d)	0.283±0.01	0.339±0.01
TDN (kg/d)	2.697±0.12	2.678±0.11
ME (MJ/d)	40.172±1.90	39.889±1.62
DM (g/kg w ^{0.75})	79.22±4.40	80.21±1.26
DCP (g/kg w ^{0.75})	4.56±0.16	5.69±0.13
TDN (g/kg w ^{0.75})	43.47±2.04	44.91±0.94
ME (MJ/kg w ^{0.75})	0.65±0.03	0.67±0.01
Water intake		
(l/d)	11.44±0.54	12.67±0.96
(ml/kg w ^{0.82})	126.77±11.56	144.38±5.18

Table 4.4.2 Serum electrolytes in growing camel calves

Parameters	Gp-1	Gp-2
Na (mEq/L)	159.75±1.11	157.25±1.89
K (mEq/L)	5.58±0.26	5.78±0.14
Ca (mEq/L)	8.51±0.37	8.92±0.15
P (mEq/L)	6.47±0.78	5.73±0.19
Mg (mEq/L)	2.40±0.14	2.05±0.05
Cl (mmol/L)	121.92±2.92	117.18±2.26
* P (<0.05)		

4.5 Studies on Camel Reproduction

Code No. : P.I./90/51CN/L31/5220.
P.I. : Dr Sumant Vyas
Associate : Dr M S Sahani

FEMALE REPRODUCTION

Non seasonal breeding - The seasonal nature of breeding (December to February) coupled with long gestation interval (approx. 13 month) in camel has resulted in large calving interval (2.5 to 3 yr). The sequential examination of ovaries by rectal palpation and ultrasound scanner during non breeding season (year before reporting period i.e. 1996) revealed presence of follicle in ovaries of some of the she camels. They were mated with virile studs. Out of eight she camels mated four conceived and calved in July-Aug 1997. The non-seasonal calving resulted out of earlier experiments employing exogenous hormones revealed very high calf mortality. Keeping this in mind the calves born were kept under the natural shadow of trees in the campus. No mortality was reported.

MALE REPRODUCTION

Evaluation of camel semen - Five adult male camels belonging to herd of National Research Centre on Camel were taken for the experiment. One male camel (K 311) did not mount on she camels after repeated trials and therefore not considered for the experiment. The semen was collected from only four male camels (188, 67, 301, 153). A total of 20 ejaculates, 5 from each male camels were collected at twice a week intervals. The temperature of artificial vagina was 40^o C at the time of collection. The ejaculates after initial evaluation were extended in Tris Egg Yolk Citrate (TYC) for preservation at refrigeration temperature (5^oC) and examined for live sperm percentage. The seminal characteristics were as follows:

Table 4.5.1 Seminal attributes of camel

Attributes	CAMELS			
	188	67	301	153
Ejaculation time (min)	5.80 ±1.39	5.58 ±0.66	6.31 ±1.37	5.0 ±1.08
Color	White	Creamish white to white	White	Creamish white to white
Gel	Thick	Thick to V.Thick	Thick to V.Thick	Thin to Thick gel
Volume	4.30 ±1.74	5.40 ±0.91	3.50 ±1.52	4.40 ±0.58
pH	8.0-8.5	8.0	8.0-8.5	7.5-8.0
Sperm Concentration (x 10 ⁶ /ml)	30.62 ±12.6	26.04 ±3.56	12.42 ±4.04	36.30 ±11.59
Motility out of 5 ejaculate	1	2	1	3
Live % 0 h	39.62 ±1.95	59.05 ±1.76	43.56 ±2.31	56.26 ±5.94
24h in TEYC	29.63 ±5.92	35.03 ±4.73	32.40 ±1.97	47.68 ±9.03
48th in TEYC	24.68 ±7.40	23.72 ±6.21	nil	41.62 12.29

AD HOC RESEARCH SCHEMES

4.6 BLOOD GROUPS AND BIO-CHEMICAL POLYMORPHISM STUDIES IN INDIAN CAMEL

Principal investigator	-	N. D. Khanna (up to September, 1997)
Associates	-	S. N. Tandon
	-	B. P. Mishra

4.6.1 **DNA Fingerprinting in camel** : A total of 14 blood samples, 10 ml each in EDTA tubes were collected from 3 breeds of camels viz. Bikaneri, Jaisalmeri and Kachchhi, chosen at random from NRCC herd, Bikaner. Camel genomic DNA was isolated from whole blood following the method of Dykes and Polesky (1988) with modifications. DNA was prepared by successive extraction with phenol:chloroform:isoamyl-1-alcohol (25:24:1) and precipitated with absolute alcohol. The DNA precipitate was collected by winding on a glass rod or pipette tip, dried and dissolved in TE buffer (10mM EDTA, pH 7.2).

Five to ten μ g DNA from each animal was digested with 5U/ μ g of the restriction enzyme *Hinf*I or *Hae* III as recommended by the manufacturer assay conditions. Restriction digestion was carried out overnight at 37^o C and checked on agarose gel for complete digestion, before loading on large analytical gel. The DNA fragments were separated on 20 cm or 25 cm long 0.8% agarose gels in TBE buffer at constant voltage of 1.5 V/cm. Lambda phage DNA- *Hind* III digest was used as molecular size marker. After electrophoresis gels were blotted on to Hybond - N nylon membrane (Amersham, UK) by capillary transfer method of Southern (1975) in 6 x SSC (0.9M NaCl, 0.09 M Sodium citrate). Cross linking of DNA fragment to nylon membrane was carried out on UV transilluminator.

Synthetic oligo nucleotide probes viz. (GTG)₅, (GGAT)₄, and (GT)₈ were labelled with (³² P) ATP using T-4 polynucleotide kinase as described by Sambrook *et al.* (1989). Pre-hybridization, hybridization and post hybridization washings were carried out as per the method described by Buitkamp *et al.* (1991). Hybridized gels were autoradiographed for overnight to 1 or 2 days on Kodak/Indu X-ray film using intensifier screens. Same membranes were repeatedly used for different oligos after deprobing and neutralization following standard procedure.

Hybridization of *Hinf*I or *Hae* III digested DNA samples to oligo probes viz. (GTG)₅, (GGAT)₄ and (GT)₈ revealed variable band profile. The enzyme probe combination of *Hinf*I - (GGAT)₄ produced individual specific DNA fingerprint pattern indicating highly polymorphic microsatellite for camel DNA analysis. Six to eight *Hinf*I digested fragments of size ranging from 1 to 6 kb were hybridized to (GGAT)₄, out of which 4 fragments were polymorphic among individuals tested.

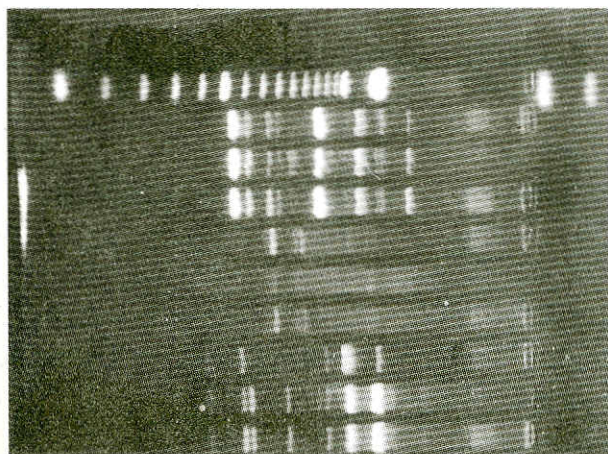
*Hinf*I-(GT)₈ combination revealed 8 to 10 fragments ranging from 2 to 23 kb sizes with less resolution of higher size fragments. Polymorphic bands were less in number, while band sharing between individuals was higher. Polymorphic bands were above 6 kb range and rather poorly resolved.

Microsatellite (GTG) 5 - *Hinf*I combination yielded clear fingerprint pattern with only 4 to 6 hybridized bands. Three bands were polymorphic among individuals. Fragment sizes varied from 2 to 12kb. Only one band was around 12 kb range while other bands were between 2 to 4 kb. DNA fingerprint pattern indicated genetic variation among individuals with band sharing more than (GGAT) 4.

Hae III - (GTG) 5 revealed 8 to 10 bands ranging between 1 to 10 kb. Two to three fragments were present in common among all the animals tested. Polymorphism was observed in the fragment of higher size (3 to 10 kb). The higher size fragment was found to be specific to the particular genetic group and was polymorphic among different breeds. A large number of sample survey will be necessary to conclude in certainty.

Hae III - (GT) 8 combination generated very less number of bands per individual and it varied between 2 to 5 in number ranging between 2 to 6 kb. There was no specific pattern observed among individuals within a breed or between breed. Band sharing was found to be highest in this enzyme - oligo combination which will not prove to be a good marker for camel DNA fingerprinting. Similarly *Hae* III - (GGAT) 4 combination produced a number of comigrating fragments in the lower kb fragments while higher fragments showed little polymorphism. Running of lower kb fragments (2 kb) from gel may yield better resolution of higher fragments.

4.6.2 Genetic variation in camel using PCR-RAPD technique : Random amplified polymorphic DNA (RAPD) technique facilitates the analysis of genetic variation in different prokaryotes and eukaryotes without prior knowledge of DNA sequence. The PCR technique was carried out for random amplification of polymorphic DNA. In all 8 random 10 mer primers were used to assay genetic polymorphism in three Indian camel breeds viz. Bikaneri, Jaisalmeri and Kachchhi.



PCR-RAPD Profile of camel genomic DNA

Out of the 8 primers used, 2 primers (G4 and AG 10) did not reveal any reproducible band profile. However, 4 primers (G1, G2, GC-10, GT-10) were found informative in camel (4.6.2.1). Different fragment patterns were observed for different primers used. Overall 5 to 15 bands were observed in agarose gels with different oligos tested. The application of this method may prove to be of immense importance in the study of genetic variation in camel.

4.7 Development of Embryo Transfer Technology in Camel

Sponsored by Department of Biotechnology, Ministry of Science and Technology, New Delhi.

Principal Investigator : Dr. Sumant Vyas
R. A. s\ S. R. R. F. 's : Dr. Parveen Arora
Dr. Yatinder Kumar
Sh. Praveen Goswami
Ms. Swati Ojha

Single Ovulation Embryo Transfer (SOET)

The cost of hormonal preparation for superovulation is a deterrent in making ETT feasible at field level. SOET (Single Ovulation Embryo Transfer) was attempted successfully in cattle. Therefore, same technique was attempted in four donor she camels. The ovaries of donor she camels were examined by ultrasound scanner. Those having mature follicle (1.5-2.0 cm.) in either of the ovaries, were mated with a virile stud. Mating was followed by inj. hCG (Profasi, Serono) 5000 i.u. for ovulation. The ovulation was confirmed on fourth day. On seventh day post mating non-surgical flushing was attempted with modified DPBS (Gibco, BRL, USA) 1.7 litres in 15-20 releases. However, no embryo could be recovered.

Multiple Ovulation Embryo Transfer (MOET)

The hormonal preparation used were F.S. H.-P. 50 mg (Schering-Plough, USA), Folltropin-V, 400 mg (Vetrepharm, Canada) and Super-Ov 75 i.u. (Ausa international, Canada).

1. The F.S.H. P. was used in three donor she camels for superovulation. The dose and schedule was as follows:

Day 0 : Inj. hCG 3000 i.u., if a mature follicle is present on any of the ovaries
Day 6-10 : F.S.H.-P, 50 mg in divided doses
Day 12-13 : Mating thrice at 12h interval and inj. hCG 5000 i.u. at the first mating
Day 19 : Flushing results as shown in table 1.

2. The Folltropin-V was used in three camels. The dose and schedule was as follows:

Day 0 : inj. hCG 3000 i.u. if a mature follicle is present on either of the ovaries.
Day 6-9 : Folltropin -V in equal divided doses.
Day 11-12 : Mating thrice at 12 h interval
Day 19 : Flushing

3. The Super-OV was used in 8 she camels. The dose and schedule was as follows :

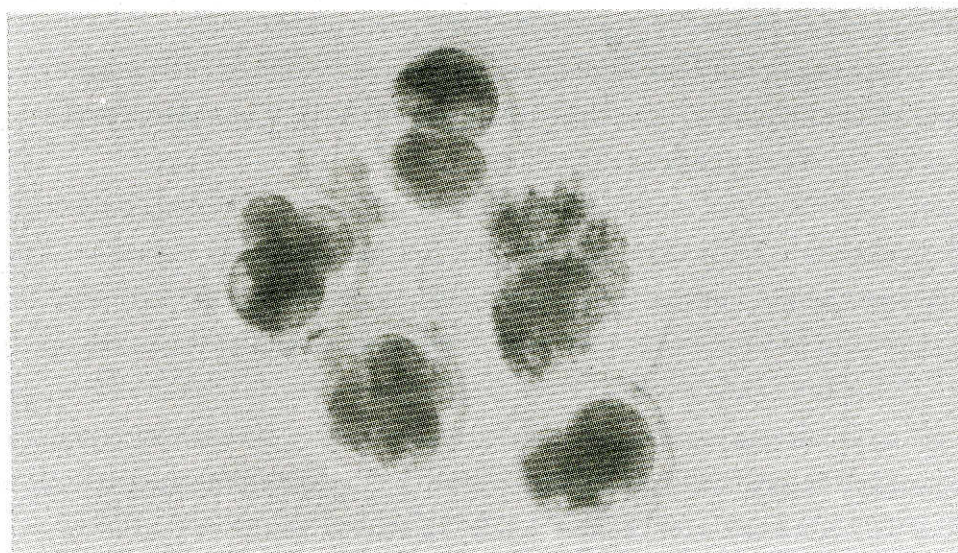
- Day 0 : inj. hCG 3000 i.u. if a mature follicle is present on any of the ovaries.
 Day 8-11 : inj. Super-OV 50 mg divided in declining twice daily doses
 Day 13-14 : Mating thrice at 12h interval Inj. hCG 5000 i.u. at the first mating
 Day 20 : Flushing

Results as shown in table. 4.7.1

In all five embryos were transferred in recipients having +1 day synchronisation. Two out of them conceived.

Table 4.7.1. Superovulatory treatments, responses and embryo recovery in donor camels.

Group No.	Superovulatory treatment	Doses	No of camel treated	No of donors flushed	No of 0	donor 1	camels Produced 2-5	embryos 6-12	Total recovered
1.	SOET	3	3	3	3	-	-	-	-
2.	MOET								
a.	F.S.H.-P	50 mg	3	3	2	-	1	-	2
b.	Folltropin-V	400mg	3	3	3	-	-	-	-
c.	Super-Ov	75 iu	8	7	2	1	2	2	21
Total			17	16	10	1	3	2	23



Camel embryos recovered from a single flushing

4.8 Network collaborative programme on crop Based Animal Production system

Date of start	:	Oct. , 1994
Reporting Period	:	April, 1997-March, 1998
Project Leader	:	Dr. N.D. Khanna (Upto 30.09.97)
	:	Dr. M.S. Sahani (From 30.09.97)
Project I/C	:	Dr. A.K. Nagpal Scientist Sr. Scale
	:	Dr. A.K. Roy Scientist Sr. Scale
	:	Sh. Ram kumar Farm Manager T-7
	:	Sh. Raja Purohit SRF
	:	Sh. B.D. Kiradoo SRF

Experiment 1. Comparative performance of pregnant and dry camels kept in sewan pasture and 3-tier grazing management systems.

This experiment was conducted from 16th July, 97 to 18th Dec., 97. Twenty five pregnant and dry female camels were randomly divided into 2 groups of 6 pregnant & 8 dry female camels in group I and 8 pregnant and 3 dry camels in group II. Group I camels were sent for 7 hrs grazing in 3 tier system while group II Camels were sent for 7 has grazing in Sewan (*Lasiurus indicus*) pasture. Camels in both the groups continued to gain live weights till 16.09.97 with fodder supplement after which all the camels lost their body weights. The loss in live wights were 83.87 g/d & 166.13 in pregnant and dry camels respectively grazed on sewan pasture and 31.34 g/d and 150.54 g/d in pregnant and dry camels respectively grazed in 3-tier system (Table 4.8.1).

Serum bio-chemical profile revealed significant difference among camel groups in respect of glucose, total protein, albumin, cholesterol, Hb, urea, Mg and Cl. Camels kept in 3-tier system tended to have better blood profile (Table 4.8.2).

Due to the El-Nino effect rainfall at Bikaner was very erratic. The plant growth of Sewan pasture did not reach to its full maturity, inspite of the fact that rainfall was higher (448.7 mm) this year than 366.6 mm rainfall last year. This year rainfall was more in June, 97 and in Oct., 97 which was not conducive for pasture growth. Last year (1996) the major rainfall was in July and Aug, 96 because of which pasture growth was good. While last year the sewan pasture yield was 43.08 q/ha correpouding to carrying capacity of 1.18 adult Camel unit or 2.36 adult cattle unit. This year the sewan pasture DM yield was only 3.95 q/h corresponding to carrying capacity of 0.11 adult camel unit or 0.22 adult cattle unit (Table 4.8.3). There was continued decline in proximate components till Oct., 97 end when rainfall caused plant growth and change in its chemical composition.

Seven hour grazing behaviour study of camels showed that animals mostly spent their time in grazing while walking (68%) and did not rest during these hours because of the comfortable ambient environment of Oct. month (Table 4.8.4).

The camel grazing caused soil nutrient loss of 0.02 units in percent carbon, 43.5 kg/h of available potash, 7.28 kg/h of available phosphate in 3 tier system while the soil nutrient loss was higher in Sewan pasture. It was 0.24 units of percent carbon, 138.33 kg/ha available potash and 21.67 kg/available phosphate (Table 4.8.5).

Forage preference and biting behaviour study revealed that camels preferred Sewan grass (56%) and Ganthia grass (33%) over other vegetation in Sewan pasture while in 3-tier system camels mostly grazed Ganthia grass (54%) and Pala (21%) shrubs. The difference was naturally on account of the availability of different vegetation in Sewan pasture and 3-tier system.

Vegetation composition of 3-tier system mostly comprised of Bui (24.8%) followed by Shinio (24.3%), Pala (14.9%) Israeli babool (10.5%) and rest of the plant species constituted <10% each.

Table 4.8.1 Body weight (kg) variations in adult female camels kept in sewan pasture and 3-tier grazing systems.

Parameters	3-Tier group		Sewan Pasture group	
	Pregnant	Dry	Pregnant	Dry
No.	6	8	8	3
Age (years)	(7.5-.5)	(6.5-10.5)	(6.5-9.5)	(6.5-10.5)
Date				
16-7-97	528.00±26.32	464.25±24.31	496.25±13.28	510.00±41.30
30-7-97	524.03±27.17	463.13±24.84	496.88±12.69	492.67±45.81
30-8-97	532.50±27.44	467.88±22.49	515.63±14.58	503.33±41.04
16-9-97	547.33±26.28	482.50±24.50	533.38±12.07	513.33±38.65
01-10-97	537.33±24.89	480.00±25.10	527.50±13.53	492.67±37.71
04-11-97	519.67±23.04	448.13±23.22	508.25±14.30	480.67±36.52
05-12-97	517.00±27.72	445.25±23.08	497.75±13.61	481.33±37.33
18-12-97	516.00±21.76	438.50±23.34	490.00±15.43	486.00±35.55
B.Wt. gain (155 days)	-13.00±5.79	-25.75±4.02	-4.86±2.59	-23.33±6.36
ADG (g/d)**	-83.87±37.36	-166.13±25.91	-31.34±16.68	-150.54±41.03

Table 4.8.2 Serum bio-chemicals of pregent ad dry camels kept in two grazing systems

Parameter	Sewan group		3-Tier group	
	Pregnant	Dry	Pregnant	Dry
Hb g/dl**	13.08±0.25	14.88±0.60	15.01±0.23	15.56±0.35
Glucose mg/dl**	94.76±4.30	109.69±2.48	99.70±2.83	115.02±2.11
T. Protein g/dl*	7.01±0.43	4.45±0.90	6.56±0.51	6.35±0.42
Albumin g/dl*	4.10±0.13	3.10±0.42	4.00±0.17	4.13±0.17
Urea mg/dl**	57.11±1.50	49.02±7.48	56.17±1.30	37.68±4.459
Cholesterol mg/dl**	45.17±3.04	25.59±3.06	30.18±3.27	35.12±3.98
ALP IU/L	74.70±15.21	72.63±4.55	68.81±3.31	69.17±6.05
AST IU/L	64.66±5.19	69.42±1.22	66.18±4.13	70.38±7.87
ALT IU/L	9.25±0.56	11.50±3.80	11.71±2.79	13.57±1.30
Na mEq/L	154.24±1.65	150.67±3.53	151.80±2.80	149.00±2.72
K mEq/L	5.70±0.43	5.77±0.52	6.84±0.14	6.60±0.34
Ca mg/dl	10.08±0.21	8.65±0.38	9.52±0.15	8.87±0.62
Mg mEq/L*	2.84±0.09	2.59±0.19	2.63±0.30	1.97±0.13
Cl mmol/L*	107.40±1.32	96.48±1.81	109.25±2.70	106.79±3.48

Table 4.8.3 Plant vigour and bio-mass yield study of Sewan pasture

Date	Height (cm)	Width (cm)	Diameter (cm)	Fresh Wt. (g) (3x3 m)	DM yield (kg/ha)
13-6-97	75.00±2.59	108.40±4.88	131.70±6.97	600.00±42.16	305.60
29-7-97	87.50±2.73	79.20±3.24	82.50±1.45	430.00±20.00	250.88
30-8-97	88.40±4.18	99.80±5.31	106.10±5.17	483.33±16.67	293.54
30-9-97	82.70±3.69	88.90±3.60	67.60±4.94	232.50±20.43	184.53
25-10-97	92.40±2.65	96.90±1.57	80.50±1.63	1100.00±66.67	710.11
26-11-97	77.10±2.42	84.40±1.55	85.20±1.47	1050.00±85.96	626.97

Av. 395.27 kg/ha

Carrying capacity = Average DM yield / (365 x DMI of 500 kg adult camel @ 2%)

= 395.27 / (365 x 10) = 0.11 Adult Camel unit/ha

or = 0.22 Adult Cattle unit/ha

Table 4.8.4 Grazing behaviour study of adult female camels in Oct, 97

Parameter	Sewan pasture		3-Tier system	
	6		6	
No. of observation				
Walking %	15.77±3.33		12.48±3.62	
Standing %	1.52±0.70		Nil	
Sitting %	Nil		Nil	
Only grazing %	10.15±17.8		4.60±2.42	
Grazing while walking %	68.30±2.49		67.65±3.44	
Only browsing %	Nil		3.07±1.42	
Browsing while walking %	Nil		9.77±1.93	
Rumination while Standing %	4.27±1.96		0.77±0.48	
Sitting %	Nil		Nil	
Walking %	Nil		1.35±0.57	
Time- 7 hours				

Table 4.8.5 Effect of grazing of adult female camels on soil fertility

Parameter	3-Tier		Sewan Pasture	
	Before expt.	After expt.	Before expt.	After expt.
pH	8.12 ^A ±0.02	8.85 ^B ±0.01	8.52 ^A ±0.06	8.77 ^B ±0.03
EC				
mmhos/cm	0.25 ^B ±0.02	0.11 ^A ±0.01	0.27 ^b ±0.05	0.15 ^a ±0.01
% Carbon	0.14±0.01	0.12±0.02	0.36 ^B ±0.03	0.12 ^A ±0.01
Available K ₂ O (kg/ha)	316.00±43.42	272.50±26.26	388.33 ^B ±20.72	250.00 ^A ±34.88
Available P ₂ O ₅ (kg/ha)	20.28±5.85	13.00±1.00	36.67 ^B ±5.51	15.00 ^A ±1.91

Experiment 2. performance of adult female camels in 3-tier grazing management system

Nine adult female camels were maintained on 7 hr daily grazing plus loppings of Jal trees in fenced 3 tier rangeland for 89 days. The camels lost 114+43.43 g/d. Blood profile revealed that Hb, glucose, total protein, albumin and cholesterol were lower in March, 98 than in Oct., 97 which might be due to change in nutritional quality of available vegetation. Further information is being complied.

4.9 Evaluation and Conservation of Double Humped Camel in Cold Desert Region

Principal Investigator	:	Dr. M.S. Sahani
Co-Investigator	:	Dr. N.D. Khanna (up to September, 1997)
	:	Dr. Raghvender Singh
	:	Dr. R. Goel
	:	Sh. Banamali Yadav (Research Associate)
	:	Capt. D.S. Rathore (Officer Incharge FRL-DET) Partapur, (Ladakh)

Col. S.K. Sareen, Director,
FRL, Leh, (Ladakh)

The preliminary survey of double humped camels (*Camelus bactrianus*) in Partapur area was conducted in collaboration with FRL-DET, Partapur (Ladakh). Rearing of this species is very economical in cold desert as it thrives well on small bushes alone and no other fodder provided to the camels except in cold months, when most of bushes are not available.

- (a) Construction work of sheds and enclosures was taken up by inviting tenders on all India basis and from other construction companies of Ladakh region. The work was awarded to lowest quoter under the supervision of State PWD Department (J&K). The work is under completion stage.
- (b) Procurement of equipment/glasswares : As proposed under the scheme Erma Scope was procured and installed. The Electronic weigh bridge and other chemicals glasswares were purchased and shifted to FRL-DET, Partapur (Ladakh).
- (c) Biochemical parameters : Data on biochemical attributes in respect of protein, albumin, creatinine and cholesterol of double humped camel were compared with single humped camel and no significant variations were recorded.

- i. Protein 7.05±0.50 g/dl
- ii. Albumin 3.89±0.350 g/dl
- iii. Globulin 3.16±0.42 g/dl
- iv. Creatinine 1.50±0.41 mg/dl
- v. Cholesterol 32.98±10.05 mg/dl

(d) The hair samples collected from neck and midside region of bactrian camel were analysed for fibre quality attributes.

Table 4.9.1 Region wise average fibre diameter and different type of fibres

Site	Fibre diameter (Micron)	CV (%)	Type of fibres (%)		
			Pure	Hetero	Hairy
Neck	39.6±0.76 (318)	34.1	73.89	25.16	0.95
Midside	26.0±0.69 (300)	46.6	70.33	25.00	12.67



Camel shed at FRL-DET, Partapur, Ladakh

5.

TECHNOLOGY ASSESSED AND TRANSFERRED

- 5.1. Package of practices for controlling calf (camel) mortality under field conditions.
- 5.2. Package of practices to provide balanced nutrition to camels at different age groups, pregnancy, draught work and during crisis period of draught.
- 5.3. Package of practices for improvement of reproductive efficiency in the field camels.
- 5.4. Package of practices for camel health management.

6.

EDUCATION AND TRAINING

- 6.1 Dr. Sumant Vyas, Scientist (Animal Reproduction) undertook PRMD, INRA centre de Tours, France, from 7th April, 97 to 25th June, 1997 on Melatonin assay in camel.
- 6.2 Dr. Rajender Kumar, Scientist (Camel Health) and Sh. Dinesh Munjal, (Computer Programmer/Operator) attended course on ARIS programme at IASRI, New Delhi from 28th August to 5th September, 1997.
- 6.3 Sh. Dinesh Munjal attended one day training course on Internet arranged by VSNL, New Delhi on 31st August, 1997.
- 6.4 Sh. Ram Dayal (Library Assistant) attended a course on "Introduction of Basisplus and techlibplus" at NIC, Delhi from 24th to 28th November, 1997.
- 6.5 Under bilateral exchange programme one veterinary graduate student from CIRAD EMVT France under took 3 months training programme on "Bench mark survey of camel rearing in Jaisalmer and Bikaner district of Rajasthan" at National Research Centre on Camel, Bikaner. The training comprised of field survey as well as job work.

6.6 During the year 1997-98 National Research Centre on Camel, Bikaner organised two weeks training course on Camel Management and Health care, which was mainly for Field Veterinarian, Officers from Border Security Force, Indian Army and SAU's.



Participants & faculty of short course on Camel Management & Health, held at NRCC during March, 1998

- 6.7 Scientist namely Dr. B.P. Mishra and Miss Poonam Jayant undertook foundation training course for ARS Scientist (FOCARS) at NAARM, Hyderabad, during the year 1997-98.
- 6.8 Shri Banamali Yadav R.A. (D.H.C.S.) trained for wool fibre analysis from 8.9.97 to 20.9.97 at C.S.W.R.I. Bikaner.

7.

LINKAGES AND COLLABORATIONS

7.1 National

- | | | | |
|----|----------------------------------|---|--|
| 1. | AIIMS, New Delhi | - | Milk protein especially lactoferrin |
| 2. | RAU, Bikaner | - | Research work of MVSc & Ph.D students |
| 3. | CCSHAU, Hisar | - | Research work of Ph.D student |
| 4. | NDRI, Karnal | - | Camel milk analysis |
| 5. | CSWRI, Avikanagar | - | Camel hair |
| 6. | CIAE, Bhopal | - | Camel drawn implements |
| 7. | S.P. Medical
College, Bikaner | - | Camel milk as nutritional adjuvant
in treatment of tuberculosis |

7.2 International

- | | | | |
|----|---------------------|---|-----------------------|
| 1. | CIRAD- EMVT, France | - | Research and training |
|----|---------------------|---|-----------------------|

7.3 Externally funded projects

1. "Development of Embryo Transfer Technology in Camel" Sponsored by Department of Biotechnology, Ministry of Science & Technology, Govt. of India.

LIST OF ARTICLES SENT FOR PUBLICATION -1997-98

1. N.D. Khanna. Role of camel production in economic uplift of societies engaged in livestock rearing in the Indian dry land. Presented in the Seminar on Poverty Alleviation through livestock development, Veterinary Associations, New Delhi.
2. M.S. Sahani and M. Rathinasabapathy. The fast dwindling species of Ladakh - A brief note. Indian farming.
3. Deepti Khanna, M.L. Gupta, A.K. Rai and N.D. Khanna. Feed and water adaptive responses of Indian camel (*Camelus dromedarius*) following dehydration and rehydration. International Journal of Animal Sciences.
4. N.D. Khanna and A.K. Rai. Investigations on work potential of Indian Camel. Camel News Letter, Syria.
5. A.K. Nagpal, Gorakh Mal, A.K. Roy, M.S. Sahani and Rajender Kumar. Growth, feed efficiency and nutrient utilisation in growing camel calves. Indian Journal of Animal Production and Management.
6. Gorakh Mal, A.K. Roy, A.K. Nagpal and Rajender Kumar. Oxalate content of sewan grass (*Lasiurus sindicus*) and its removal through water treatment. Indian Journal of Animal Nutrition.
7. A.K. Nagpal, M.S. Sahani, A.K. Roy and Gorakh Mal. Voluntary feed intake and utilization of macro and micro nutrients in dry and pregnant camels. Indian Journal of Animal Nutrition.
8. M.S. Sahani, M. Rathinasabapathy and Gorakh Mal. Milking technique and other factors affecting milk production potential in different breeds of camel under farm conditions. Indian Journal of Animal Sciences.
9. M.S. Sahani and M. Rathinasabapathy. Factors affecting annual hair production in indigenous breeds of camels (*Camelus dromedarius*) under farm conditions. Indian Journal of Animal Sciences.
10. A.K. Nagpal, M.S. Sahani, A.K. Roy and Gorakh Mal. Voluntary feed intake and utilization of macro and micronutrients in dry and lactating Bikaneri camels. International journal of animal sciences.
11. Gorakh Mal, M.S. Sahani and A.K. Nagpal. Chemical composition and vitamin-C content of milk in Indian camels managed under farm conditions. Indian Vety. Journal.

12. A.K. Nagpal, Gorakh Mal, Raja Purohit and B.D. Kiradoo. Utilization of Bui (*Aerato-mentosa*) leaves, an unconventional plant resource as camel feed. Indian journal of animal nutrition.
13. A.K. Nagpal, B.D. Kiradoo, Raja Purohit, Gorakh mal and Ram Kumar. Comparative studies on stall-feeding of *Phaseolus acniti-follus* *aconiti-folivs* and continuous *Lasiurus sindicus* pasture grazing based camel production systems in arid ecosystem. Indian journal of animal nutrition.
14. N.D. Khanna. Indian camel pastoral production system and their indigenous knowledge. Camel News Letter, Syria.
15. N.D. Khanna. Camel production and breeding in Indian dry lands. Presented in National Seminar on "Improved use of pack animals and its related aspects" held at college of Vety. Sci. and Animal Husbandry GAU, Banaskantha.
16. N.D. Khanna. History of Camel in Indian context. Asian Agri-History Foundation, Secunderabad.
17. Deepty Khanna, M.L. Gupta, A.K Rai and N.D. Khanna. Adaptive changes in blood enzymatic activity of dehydrated and rehydrated camels (*Camelus dromedarius*). International Journal of animal sciences.
18. N.D. Khanna. Working camels. Presented in the IInd Pan Common Wealth Veterinary Conference at Bangalore.
19. N.D. Khanna and U.K. Bissa. Indigenous knowledge of Indian camel pastoral production system and ethno-veterinary practices. Submitted in International conference of Ethnoveterinary Medicine Research and Development at Pune.
20. Deepti Khanna, M.L. Gupta and N.D. Khanna. Adaptive changes in blood biochemical constituents of dehydrated and rehydrated camels during winter and summer months. Indian Journal of Animal Sciences.
21. A.K. Nagpal. Nutrition requirements and availability of feed for pack camels. Submitted in IInd Pan Commonwealth Conference.
22. A.K. Nagpal and M.S. Sahani. Effect of dietary supplementation of phosphorus on growth and nutrient utilization in camels calves. Journal of applied animal research.
23. S. Vyas, P. Goswami, A.K. Rai and N.D. Khanna Use of tris and lactose extenders in preservation of camel semen at refrigerated temperature. Indian Vety. Journal.
24. G. Laval and S.N. Tandon. An investigation into camel trade at livestock fair, Gogameri 1997. Indian Uournal of Animal Sciences.

25. S. Vyas, A.K. Singh, P. Goswami, A.K. Rai and N.D. Khanna. Superovulation and non surgical embryo flushing in Indian camel. Presented in XIV Annual Convention of ISSAR and National Symposium, Bidar, Nov. 1997.
26. G. Laval, S.N. Tandon and N.D. Khanna. Bench mark survey of camel keeping in Bikaner and Jaisalmer districts of Rajasthan. Indian J. of Animal Sciences.
27. S. Vyas, A.K. Rai and N.D. Khanna. Treatment of cystic ovarian degeneration in Indian camel (*Camelus dromedarius*) Indian Vet. Journal.
28. S. Vyas, N. Sharma, U.K. Bissa, B.L. Chirania and B.L. Bishnoi. Effect of prostaglandin F2 alpha on induction of parturition in she camel (*Camelus dromedarius*). Indian Journal of Animal Reproduction.

LIST OF ARTICLES PUBLISHED IN 1997-98

1. S.P. Agarwal and N.D. Khanna. Preovulatory LH surge in female camels (*Camelus dromedarius*) and its association with subsequent ovarian events. Indian Vet. Journal 74 (11) : 759-761
2. S.P. Agarwal N.D. Khanna Early pregnancy diagnosis through progesterone estimation in camels (*Camelus dromedarius*). Indian Vet. Journal 75 (2) : 131-133.
3. S.P. Agarwal and N.D. Khanna. Ovario-pituitary response to exogenous hormones in the post partum female camels (*Camelus dromedarius*). Indian Journal of Animal Science 67 (11) : 953-954.
4. N.D. Khanna and U.K. Bissa. Indian camel pastoral production system and their indigenous knowledge. Indian Farming Vol. 47 No.3 (6) : 28-31.
5. M.S. Sahani and U.K. Bissa. Camel husbandry practices in Kachchhi region of Gujarat. Indian Farming vol. 46 NMO.11 (2) pp 22-24.
6. N. D. Khanna. The utility of the camel in augmenting the dry land economy in India. Draught Animal News No. 26 May, 97 39-40.
7. S. Vyas, J.P. Ravault, B. Faye and P. Chemineau 1997. The nyctohemeral rhythm of melatonin secretion in camel (*Camelus dromedarius*). *Revue Elev. Med. Vet. Pays trop.* 50 : 261-263.

LIST OF APPROVED ON-GOING PROJECTS

- 9.1 To study work standards in camel and to associate work standards with physical, physiological and biochemical parameters
- 9.2 Studies on quantitative and qualitative genetic parameters in Indian camels
- 9.3 To develop suitable management practices for rearing camel
- 9.4 Studies on camel Nutrition
- 9.5 Studies on camel Reproduction

RAC, MANAGEMENT COMMITTEE, SRC, QRT ETC. MEETINGS WITH SIGNIFICANT DECISIONS

The members of Research Advisory Committee are as below:

1. Dr. R. M. Acharya - Chairman
2. Dr. N. K. Bhattacharya - Member
3. Dr. S. S. Rathore - Member
4. Dr. Arun Kumar Varma - Member

Second meeting of RAC held on 22nd and 23rd January, 98, and recommendations given by the RAC are as follows:

1. There should be active collaboration of the centre with state Animal Husbandry Depts, and SAU's in the region where camel is an important economic species and with ICAR institutes on various aspects of research programmes particularly IVRI, CSWRI, NDRI.
2. There should be multidisciplinary approach in every research programme as far as possible and research projects should be developed accordingly. Major emphasis should be on draft.
3. There is a need for creation of strong database on camel research and development, centre should give top priority in this regard.
4. Suggestions given on project "camel draft", "management practices" and "camel disease surveillance" should be incorporated in the future programme of work.

5. Committee requested to HQ through ADG that in the sanctioned scientific cadre strength distribution of discipline is not satisfactory and it should be revised with immediate effect. Second that centre is having very limited staff position in almost all categories particularly technical staff. This should be taken on priority by the HQ for rapid progress of the centre. Committee strongly recommended the proposals of IX plan and perspective plan where in the requirement of funds and manpower proposed by the centre should be implemented expeditiously so that meaningful research work can be carried out and its results transferred to the farmers engaged in camel rearing through respective state development agencies.
6. RAC should meet at least twice a year, once in January/February to review the progress of ongoing projects and formulate programmes for the next year and again in September/October to review the progress of implementation of projects and suggest any midterm correction if needed. Projects should essentially be multidisciplinary and time bound. The project leader should be from the discipline which is to contribute the maximum to the research project.

MANAGEMENT COMMITTEE OF NATIONAL RESEARCH CENTRE ON CAMEL, BIKANER

1. Director, N.R.C. on Camel, Bikaner	Chairman
2. Director, Animal Husbandry deptt. Govt. of Rajasthan, Jaipur (Raj.)	Member
3. Director, Animal Husbandry Deptt. Govt. of Gujarat, Ahmedabad. (Gujarat)	Member
4. Dean, College of Vet & Animal Sciences, RAU, Bikaner	Member
5. Dr. Kiran Singh, Asstt. Director General (AN&P) ICAR Krishi Bhawan, New Delhi.	Member
6. i) Sh. Syed Mujahid Ali Naqui, 152-53, Amarnath Ji Ki Bagechi, Adarsh Nagar, Jaipur	Member
ii) Sh. Tara Singh, CPI office, Jaipur	Member
7. Finance & Accounts officer, Central Institute for Research on Goats, Makhdom (U.P.)	Member
8. i) Dr. M.S. Sahani, Principal Scientist N.R.C. on Camel, Bikaner (Raj.)	Member
ii) Dr. S. N. Tandon, Senior scientist N.R.C on camel, Bikaner (Raj.)	Member
iii) Dr. Sumant Vyas, Scientist, N.R.C. on Camel, Bikaner	Member
9. Administrative officer, N R C on camel, Bikaner (Raj.)	Member
	Secretary

The following members of management committee attended the meetings held on 28th May, 1997:

1. Sh. Tara singh, C.P.I. Jaipur
2. Shri Sayed Mujahid Ali Naquvi, Advocate, Jaipur
3. Dr. S.S. Sharma, Dean, CVAS, Bikaner
4. Dr. M.S. Sahani, Principal Scientist, NRCC, Bikaner
5. Dr. S. N. Tandon, Senior Scientist, NRCC, Bikaner
6. Sh. Ashok Mallick, AAO, NRCC, Bikaner

Suggestion given by the management committee members for the improvement of management of the centre.

- i. Dr. S.S. Sharma, Dean, CVAS, Bikaner suggested that there should be more extension work. The main idea behind this is to have more interaction with the camel breeders. It was felt that for achieving this work one scientist in extension field and one additional vehicle is needed to provide proper transport facilities. Dr. Sharma also suggested that for monitoring and surveillance of camel diseases centre should establish a laboratory for disease diagnosis, surveillance and monitoring with proper staff and facilities.
- ii. The management committee members were unanimous in requesting the competent authority for taking early decision in the matter and to provide matching scientific and other manpower and appropriate budget.

SRC MEETING

During the year 1997-98 one half yearly and one yearly scientific review committee meeting was held under the chairmanship of Director of institute, rest of members were Dr. G.R. Purohit, Dean CVAS, Bikaner, Dr. K.M.L. Pathak, professor Veterinary Parasitology and Brig. N.M. Singhvi.

All SRC members emphasized for the take up of applied research by NRCC for project based budgeting.

The Quinquennial Review Team (QRT) of the National Research centre on camel, Bikaner is as under:

1. Dr. D.S. Balain, Chairman
Former DDG (AS), ICAR
50, Nayayapuri,
Karnal

- | | | |
|----|--|------------------|
| 2. | Dr. B.C. Patnayak
Former Director, CSWRI
3/8, HIG Flats, B.D.A. Flats,
Chandrashekharapur
Bhubneshwar - 751016 | Member |
| 3. | Dr. P.L. Arya,
Ex. Prof. Pathology, RAU
A/7-A Natraj Nagar,
Jaipur | Member |
| 4. | Dr. Sutaj Bhan Singh
Prof. Animal Genetics & Breeding
Rajasthan Agriculture University
Bikaner | Member |
| 5. | Dr. Arun Varma
ADG (AN&P), ICAR,
Krishi Bhavan, New Delhi | Member secretary |

QRT members suggested that the peer group recommendations need to be modified suitably by emphasizing the following aspects:

- i. Basic and applied research on camel improvement.
- ii. Leadership in camel research and development.
- iii. Act as national repository on informatics
- iv. Establishing international and national linkages.
- v. NRCC should develop facility for international training on camel research and development.
- vi. NRCC to develop package of practices on camel based range land farming, transport and race systems.

On research results as basis for formulating research projects QRT suggested:

- i. Development of elite germ-plasm herds of standardized breeds in their respective home tracts.
- ii. Devising camel management practices suitable for mixed farming systems including cartage and loading.
- iii. Integrated Range Management for camel.
- iv. Standardization, conservation and development of indigenous camel germplasm resources.
- v. Evaluation of available in hot arid and cold desert regions camel strains and breeds.

- vi. Integrated feeding system for rangeland and intensive in house camel management.
- vii. Improvement in reproductive efficiency of camel.
- viii. Sero-surveillance and disease investigation.
- ix. Studies on physiology of work potential and improvement.

This QRT recommends that all the newly proposed projects should be planned on Project Based Budgeting guidelines.

For Transfer of Technology and Extension activities QRT suggested that linkages with rural development programme transfer of technology, establishment of registered camel, breeds, farmer level training courses on camel management, establishment of camel clinics need emphasis. These are the programmes which have impact values and can create confidence among farmers. Package of practices developed should be popularized by establishing linkages with department of Animal Husbandry of the State Governments. Funds may be allocated separately for such programmes. Camel day or camel meals also need to be organized as a part and parcel of extension activities.

11.

PARTICIPATION OF SCIENTISTS IN CONFERENCES, MEETING, WORKSHOPS, SYMPOSIA ETC. IN INDIA AND ABROAD

1. Dr. Raghvendra singh, Scientist attended a Hindi workshop organised by ICAR at New Delhi from 28-29th October, 1997.
2. Dr. Sumant Vyas, Scientist, participated in ISSAR, 14 th Annual convention at Bidar Veterinary College from 14th to 16th November, 97 and was honoured with silver medal.
3. Dr. Rajender Kumar, Scientist attended a Hindi workshop from 10th to 12th, December at NAARM, Hyderabad.
4. Dr. Raghvendra Singh, Scientist attended a National seminar on pack animal (NSPA) at G.A.U. from 17-18 Dec., 1997.

12. WORKSHOPS, SEMINAR, SUMMER INSTITUTE, FARMERS DAY ETC. ORGANISED AT THE INSTITUTE

12.1 Kishan Mela and Kishan Gosthi : A kisan Mela was organised at the centre on 30th March, 1998, as a part of celebration of golden Jubilee of India's independence. In this one day event, an exhibition on camel husbandry and practices and latest technological know how achieved by the centre was inaugurated by the chief guest Sh. Het Ram Bishnoi, Chairman, Utari Rajasthan Milk Union Ltd., Bikaner. The farmers visited the camel farm and were explained about the functioning of various laboratories, the farmers queries on camel diseases and other modern managemental practices were answered by the subject matter specialists, whereas, the scientists of the centre also gathered feedback from the farmers about the traditional camel husbandry practices.



A view of Ushtra Mela held during the Golden Jubilee Year of Independence

12.2 Camel health camps at adopted villages : NRCC organised two camel health camps in the adopted village Gadwala during the reporting period. During these camps the subject matter specialist conducted Kishan Gosthi and also attended the health related problems of camel farmers.

13. DISTINGUISHED VISITORS : The National Research Centre on Camel, Bikaner, received 3,720 visitors. The visitors included Scientist, Educationists, Administrators, Defence officers, Indian and Foreign tourists.

14. PERSONNEL : Dr. N.D. Khanna founder Director of the Institute superannuated on 30th September, 1997. Dr. M.S. Sahani assumed charge of Director after that.

15. SPECIAL INFRASTRUCTURAL DEVELOPMENT : Local Area Network (LAN) has been created under ARIS. All laboratories and Units are connected through Computer Network.

कर्मचारी वर्ग

वर्ष 1997-98 में केन्द्र में स्वीकृत पदों की संख्या 65 थी। जिसमें निदेशक, वैज्ञानिक (12), तकनीकी (21), प्रशासकीय (10) व आधारी कर्मचारी (22) कार्यरत रहे।

बजट

वित्तीय वर्ष 1997-98 में योजना मद में 99.73 लाख तथा गैर योजना मद में 50.47 लाख रुपये की धनराशि स्वीकृत की गई। सम्पूर्ण धनराशि उपयोग में लायी गई।

उष्ट्र प्रक्षेत्र

वर्ष के प्रारम्भ में कुल 234 और अन्त में 252 बीकानेरी, जैसलमेरी, कच्छी, अरब x बीकानेरी, सांचोरी व मारवाड़ नस्ल के ऊँट थे। केन्द्र पर उपलब्ध ऊँटों में वर्ष 1997-98 के दौरान मृत्युदर 3.90 प्रतिशत थी। इस केन्द्र के द्वारा ऊँट पालकों को उष्ट्र प्रजनन की सुविधा निशुल्क देय है।

वर्ष 1997-98 के दौरान केन्द्र पर नजदीकी गांवों से ऊँट पालकों व किसानों द्वारा प्रजनन हेतु लाई गई ऊँटानियों को केन्द्र द्वारा उत्तम नस्ल के नर ऊँट उपलब्ध कराये गये।

इसके अतिरिक्त राष्ट्रीय उष्ट्र अनुसंधान केन्द्र द्वारा नस्ल सुधार कार्यक्रम के अन्तर्गत उन्नत नस्ल के ऊँट राज्य सरकार के पशुपालन विभाग के माध्यम से ग्राम पंचायत स्तर पर वितरित किये गये। केन्द्र के फार्म क्षेत्र में वृक्षारोपण के अन्तर्गत 4000 पौधे लगाये गये जिसमें मुख्यतया नीम, सरस, अरडू व बोगनवेलिया हैं।

अर्ध गहन प्रबन्ध के अन्तर्गत केन्द्र में विद्यमान 200 ऊँटों के समूह को रोजाना 6 घण्टे प्रतिदिन परिक्षेत्र में चरने के लिए छोड़ा गया।

शोध कार्य

1. ऊँट के कार्य प्रमाप तथा इन प्रमापों का भौतिक शारीरिक क्रियाओं तथा जैव रासायनिक सम्बन्धों पर अध्ययन- मादा ऊँटों में दौड़ प्रमापों के मूल्यांकन के अन्तर्गत भौतिकी शारीरिक क्रियाएं व जैवरासायनिक विषयों

का अध्ययन किया गया। 6 से 8 साल तक की मादा ऊँटों को (477 ± 16.7 कि. ग्रा.) निश्चित अवधि हेतु प्रशिक्षित किया गया। मरुस्थलीय मार्ग पर दौड़ के दौरान अधिकतम गति 8.25 मी./स आंकी गई। मुख्य शारीरिक क्रिया सम्बन्धी प्रमाणों का अध्ययन किया गया व दौड़ से पहले व बाद में रक्त नमूने लिये गये। श्वसन दर व स्पन्दनदर (57.67 ± 1.36 प्रति मिनट व 7.66 ± 0.21 प्रति मिनट की क्रमशः दौड़ से पूर्व, 57 प्रति व 215 प्रतिशत दौड़ के बाद में), ग्लूकोज स्तर व ट्राइग्लिसराइड की बढ़ोतरी देखी गई। 24 घण्टे के आराम के बाद उनके स्तर में कमी पाई गई। ग्लूटाम्यल ट्रांसफिरेक्स, कालेस्ट्रोल व यूरिया में विशेष अन्तर नहीं देखा गया।

2. ऊँटों में होने वाले परजीवी रोगों पर अध्ययन- इस अध्ययन के अन्तर्गत पूर्णतया स्वस्थ और पांव से प्रभावित पशुओं के रक्त नमूने लिये गये। सीरम में विभिन्न संघटकों का विश्लेषण किया गया। इस अध्ययन के अन्तर्गत मुख्यतया पांव रोग से सम्बन्धित एन्जाइम ट्राइग्लिसराइड, यूरिया, ग्लूकोज व ग्लोब्यूलिन का स्तर अधिक आंका गया। इन मानदण्डों को आधार मानते हुए अध्ययन किया गया।

3. ऊँटों के पोषण पर अध्ययन- यूरियामिश्रित शीरा खनिज लवण प्रभाव के अन्तर्गत ऊँटों के बढ़ते हुए बच्चों को दो अलग-अलग समूहों में विभाजित करते हुए उन्हें अतिरिक्त ऊर्जामय भोजन दिया गया। जिसके अन्तर्गत प्रथम समूह के बच्चों को खाद्य आहार के रूप में मूंगफली गुना (भरपेट व साथ 1 कि.ग्रा. पशुआहार) व द्वितीय समूह बच्चों को मूंगफली गुना (पशु आहार दाने की 50 प्रतिशत नाइट्रोजन को यूरिया शीरा व खनिज लवण ब्लाक द्वारा पूरी की गई) प्रथम समूह को दिये गये आहार का प्रतिदिन औसत प्राप्त द्वितीय समूहों को दिये गये आहार की अपेक्षा अधिक रहा। मदकाल के दौरान व्यस्क ऊँटों में विभिन्न चारों की पोषक उपयोगिता पर अध्ययन किया गया। जैसे गुड़, तिल का तेल, गुलिका सकेन्द्रण अनुपूरक आदि। झूट में (डी.एम.आई.) सूखे चारे की ग्रहणता में औसतन रूप में कमी आंकी गई। चयापचय विषयों पर भी अध्ययन किया गया।

4. ऊँट की आनुवांशिकी विषयों का गुणात्मक व मात्रात्मक अध्ययन - इस अध्ययन के अन्तर्गत बीकानेरी नस्ल के नवजात बच्चों का जन्म भार जैसलमेरी व कच्छी नस्ल के नवजात बच्चों के भार से (क्रमशः $38.06 + 0.47$ किग्रा., $36.76+0.61$ किग्रा., $35.40+0.65$ किग्रा.) अधिक देखा गया। ऊँटों के नवजात बच्चों के शारीरिक भार पर नस्ल, वर्ष, ब्यांत व लिंग का प्रभाव देखा गया। नर व मादा बच्चों के भार पर अध्ययन करते हुए यह देखा गया कि जन्म के समय नर बच्चा मादा की अपेक्षा अधिक वजन में होता है। बीकानेरी, जैसलमेरी एवं कच्छी ऊँटनियों में गर्भधारणा 60.46 प्रतिशत, जननदर 33.33 प्रतिशत, गर्भकाल $393.2+1.43$ दिनों का व दो ब्यांत में अन्तराल $734.7+5.85$ दिनों का देखा गया। दुग्ध उत्पादन क्षमता प्रातःकाल में सायंकाल की अपेक्षा अधिक देखी जा सकती है। चौथी ब्यांत में पांचवी व तीसरी ब्यांत की अपेक्षा औसत दुग्ध उत्पादन क्षमता अधिक देखी गई। ऊँटों में जैव रासायनिक पर रूपता के अन्तर्गत बीकानेरी, जैसलमेरी, कच्छी व अरब x बीकानेरी आनुवांशिक नस्ल पर अध्ययन किया गया। भारतीय ऊँटों के दुग्ध में रासायनिक संरचना व विटामिन सी. की मात्रा को आंका गया। नस्ल के आधार पर वार्षिक बाल उत्पादन क्षमता बीकानेरी बच्चों में जैसलमेरी व कच्छी की अपेक्षा अधिक रही।

5. ऊँटों में जनन सम्बन्धी विषयों पर अध्ययन - जनन सम्बन्धी विषयों के अध्ययन के अन्तर्गत अप्रजनन काल में गर्भित सांडों के पैदा हुए बच्चों में मृत्युदर अधिक देखी गई। इसको ध्यान में रखते हुए उन्हें केन्द्र के घने छायादार पेड़ों के नीचे रखा गया। फलस्वरूप मृत्युदर शून्य आंकी गई।

वीर्य एकत्रण हेतु 5 व्यस्क ऊँटों को परीक्षण हेतु लाया गया। केवल उनमें से 4 ऊँटों से ही वीर्य संग्रहण किया जा सका। वीर्य एकत्रण हेतु कृत्रिम योनि का प्रयोग किया गया। कृत्रिम योनि का ताप 40 डिग्री सेल्स. रखा गया।

6. ऊँटों के रक्त समूह व जैव रासायनिक पर-रूपता पर अध्ययन - भारतीय ऊँटों के रक्त समूह एवम् जैवरासायनिक पररूपता पर अध्ययन किया गया। डी.एन.ए. परीक्षण हेतु बीकानेरी, जैसलमेरी व कच्छी ऊँटों के कुल 14 रक्त

नमूने लिये गये। डाइकस और पोलस्की (1998) की परिष्कृत विधि द्वारा रक्त से डी.एन.ए. प्राप्त किया गया। स्पष्टतया ऊँटों की तीनों नस्लों बीकानेरी, जैसलमेरी व कच्छी में जी.जी.ए.टी. (4) परीक्षक (प्रोब) की सहायता से पहचान करना सम्भव है। परन्तु अधिक रक्त नमूनों की जाँच करने पर ही कोई उचित निष्कर्ष निकाला जा सकता है। आणविक आनुवांशिक अध्ययन के द्वारा जीनोमिक डी.एन.ए. के पृथक्कीकरण के लिए सरल रूपान्तरित तकनीकी विकसित की गई। ऊँटों में आनुवांशिक भिन्नता अध्ययन के लिए पी.सी.आर-आर.पी.डी. का अध्ययन जो जारी है। आरम्भिक परीक्षणों से पता चला है कि आनुवांशिक भिन्नता के अध्ययन में तकनीकी विधि भी अत्यधिक महत्वपूर्ण हो सकती है।

7. ऊँटों में भ्रूण प्रत्यारोपण तकनीक का विकास - ऊँटों में भ्रूण प्रत्यारोपण तकनीक के अन्तर्गत विभिन्न हार्मोन दवाएं जैसे कि, एफ.एस.एच.पी. (50 एम.जी.) फालट्रोपिन बी (400 एम.जी.) तथा सुपर ओव (75 आई. यू) का प्रयोग बहुडिम्ब स्वलन (Multiple ovulation) के लिए किया गया। 14 दाता मादा ऊँटों में से कुल 23 भ्रूण प्राप्त हुए। इनमें से 5 भ्रूणों को प्रापक (Recipients) मादा ऊँटों में प्रत्यारोपित किया गया। दो प्रापक मादा ऊँट गर्भित हैं।

8. फसल सम्बन्धित पशु उत्पादन नेटवर्क कार्यक्रम - फसल सम्बन्धित पशु उत्पादन नेटवर्क कार्यक्रम के अन्तर्गत गर्भित व खाली ऊँटनी को सेवनघास व तीन प्रकार के चारागाह प्रबन्ध प्रणाली के अन्तर्गत रखते हुए तुलनात्मक अध्ययन किया गया। दोनों प्रकार के जानवरों को अलग-अलग समूह में बांटा गया। इस प्रकार देखा गया कि सेवन चारे व तीन प्रकार के चारागाह प्रणाली अन्तर्गत उनके शरीर भार में प्रारम्भ में वृद्धि व तत्पश्चात् कमी (सेवनचारा क्रमशः 83.87 ग्राम प्रति व 166.13 ग्राम प्रति, तीन प्रकार चारा प्रणाली क्रमशः 31.34 ग्राम प्रति व 150.54 ग्राम प्रति) आंकी गई। सीरम जैवरासायनिक अध्ययन में दोनों समूहों में ग्लूकोज, कुल प्रोटीन, एल्ब्यूमिन, कालेस्ट्रॉल, एच बी, यूरिया, एम जी व क्लोरिन की मात्रा में अन्तर पाया गया। ऊँटों के चरने के आचरण (7घण्टे) के अन्तर्गत देखा गया कि वे अपना ज्यादातर समय (68 प्रतिशत) घुमते हुए व्यतीत करते हैं। मृदा पोषकीय कमी तीन प्रकार के चारागाह की तुलना में सेवन चारे में अधिक देखी गई। ऊँटों की चारा प्राथमिकता में सेवनघास, गनठीयां, पाला आदि क्रम में देखे गये।

9. ठण्डे मरुस्थल में दो कुबड़ वाले ऊँटों का मूल्यांकन व संरक्षण योजना - इस अध्ययन के अन्तर्गत शीत मरुस्थल परतापुर (जिला लद्दाख) में दो कुबड़ वाले ऊँटों पर प्रारम्भिक सर्वेक्षण एफ आर एल डी ई टी परतापुर के सहयोग में किया गया। जैवरासायनिक सम्बन्ध (प्राचाल) अध्ययन के अन्तर्गत वयस्क ऊँटों के रक्त नमूने लिये गये व सीरम को परीक्षण के लिए रखा गया।

केन्द्र में स्वर्ण जयंती के अवसर पर किसानमेले का आयोजन (30 मार्च 1998) रखा गया। केन्द्र की ओर से गाढवाला में दो उष्ट्र सम्बन्धित स्वास्थ्य शिविर भी लगाये गये।

प्रकाशन

वर्ष 1997-98 में 7 शोध पत्र प्रकाशित हुए तथा 26 प्रकाशन हेतु विभिन्न शोध पत्रिकाओं में भेजे गये।

आंगतुक

केन्द्र में वर्ष 1997-98 दौरान 3720 आगन्तुक आये जिनमें वैज्ञानिक शिक्षाविद, प्रशासक, रक्षा अधिकारी तथा भारतीय एवं विदेशी सैलानी प्रमुख थे।

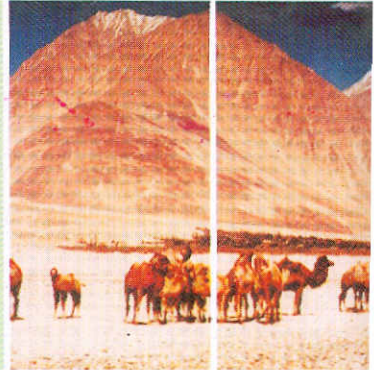
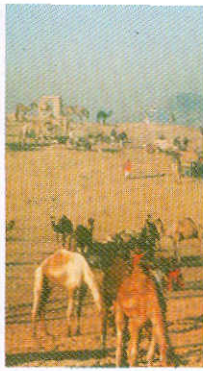




Release of NRCC Brochure by Dr. N.D. Khanna, Ex. Director, NRCC



Chairman, URMUL, Bikaner visiting the Exhibition during Kisan Mela at NRCC.



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