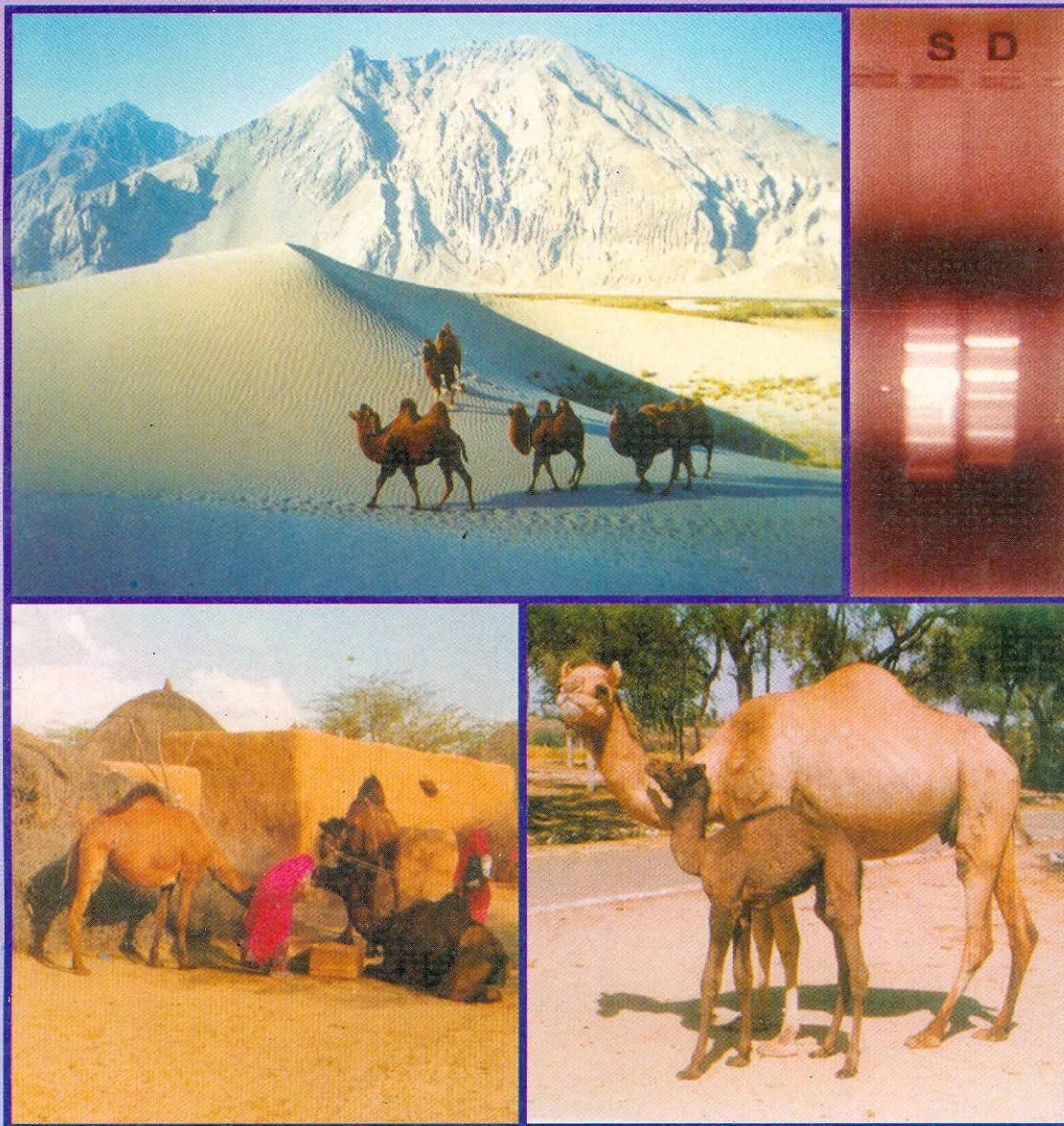
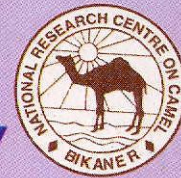




वार्षिक प्रतिवेदन Annual Report 1998-99



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Jorbeer, BIKANER

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वार्षिक प्रतिवेदन
Annual Report
1998-99

(Estd. 5th July, 1984)

Director : Dr. M.S. Sahani



National Research Centre on Camel



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PREFACE

It gives me immense pleasure to present the Annual Report (1998-99) of National Research Centre on Camel (NRCC), Bikaner.

The report presents detailed account of the progress of research programmes, manpower, funds, organizational structure, infrastructure development, national and international linkages, extension activities and so on.

The Centre in collaboration with Rajasthan Agricultural University, Bikaner, organized the First International Seminar on "Camel Applied Research and Development" on 10-11th August, 1998 at Bikaner which was of special significance in the history of the Centre. For the first time 2 camel calves were born out of 5 recipient embryos under Embryo Transfer Technology programme. The initial trial on therapeutic utility of raw camel milk as nutritional supplement gave encouraging results in faster recovery of tuberculosis disease in human beings.

New programmes in race potential of indigenous camels and breed characterisation indicated promising results. Renovation of ARIS unit under National Agricultural Technology Project was carried out.

We express our sincere gratitude to Dr. Kiran Singh, DDG (Animal Science) ICAR, DR. Arun Varma, ADG(AN&P) and other officials of ICAR headquarters for their keen interest, guidance and support. The credit for overall implementation of programme and achievements goes to scientists, technical staff, publication committee, incharge technical cell, Computer unit and other staff members of NRCC.



(M.S. Sahani)
(Director)

EXECUTIVE SUMMARY

NRC on Camel was established on 5th July, 1984. Prior to 1984 the Centre was known as Camel Breeding Farm under the aegis of College of Veterinary and Animal Science, Rajasthan Agricultural University, Bikaner and before that with the Department of Animal Husbandry Government of Rajasthan. Over the years the Centre has developed good infrastructure facilities and modern laboratories.

During the year 1998-99 the sanctioned staff strength was 76 and staff in position was 67 consisting of 1 RMP, 12 Scientific, 22 Technical, 10 Administrative and 22 Supporting Staff. The budget allocation under Plan was Rs.100.00 lakhs and under Non-plan was Rs.71.50 lakhs, which were fully utilised.

The farm herd at the beginning and close of year was 252 and 257. The herd comprised mainly of Bikaneri, Jaisalmeri, Kachchhi and few cross-breeds (Arabi X Bikaneri).

The total number of books in the library of the centre stands at 1254 including 223 in Hindi and the bound volume of journals at 110. This year 116 new books were procured. The Centre continued its post graduate research programme with CCS HAU, Hisar and RAU, Bikaner.

The research agenda of National Research Centre on Camel, Bikaner was pursued through institutional research projects, ad-hoc research schemes under AP-CESS fund and collaborative research programmes.

Two SRC meeting and one Management Committee meeting were held during the period under report. The QRT report of National Research Centre on Camel, Bikaner for the period (1991-96) was submitted to the Council.

The following seminars and meetings were conducted by National Research Centre on Camel, Bikaner during the year:

1. A two day International Seminar on "Camel Applied Research and Development" was organised on 10-11th August, 1998 in collaboration with RAU, Bikaner.
2. Organisation of Hindi Pakhwada from 14th to 28th September, 1998.
3. Institute Joint Council meeting was organised on 7th September, 1998.

Highlight of Research :

The comparative study on race potential of indigenous camel breeds aged 4-5 years for a distance of 3 km. Kachchha track indicated superiority of Jaisalmeri females followed by Jaisalmeri males in speed over both sexes of Bikaneri breed.

The breed characterisation of dromedary camels was continued using PCR-RAPD. Out of 10 oligo primers, three primers GT 10, OP-08 and G2 revealed reproducible pattern of camel genomic DNA. The GT10 was found to be most informative in camel, which indicated *inter* and breed differences.

The significant research achievement in the field of camel reproduction was standardisation of super ovulation, embryo collection and its transplantation in recipients camels under ETT programme. Two ETT calves were born for the first time. Trial on augmentation of early puberty in camel heifers at 3 years of age using Super-OV and clomphene citrate, indicate 72.7% conception rate.

Comparative trial of supplementary feeding to breeding studs during breeding season indicated superiority of pellet concentrate over the Til oil and Gur in terms of reduction in body weight and better digestibility.

The data analyzed on the epizootiology of mange in camels under farm condition over the years (1991-97) indicated significant variation due to age and sex. The incidence of mange was highest during September - December months as compared to January - April and May-August months. Therapeutic efficacy of Himax ointment and Amitraz has indicated Amitraz to be more effective and economical against mange in camels.

The preliminary trials on therapeutic role of raw camel milk against Tuberculosis was carried out in collaboration with S.P. Medical College and Govt. T.B. Hospital, Bikaner. The treatment groups under empyema and multiple drug resistance indicated faster recovery as compared to control groups in terms of improvement in appetite, body weight, haemato-biochemical parameters and radiological findings.

Under the A.P. Cess fund Scheme "Evaluation and conservation of Double Humped Camel in cold desert region of Ladakh" research trials were carried out on double humped camel of Nobra Valley, Ladakh in collaboration with DRDO-FRL, Leh. The blood biochemical attributes between two species revealed almost similar values except serum urea, which was significantly higher in double humped camel. The Least Square means of biometry data indicated significant effect of sex. The study on genetic variability between two species of camels using PCR-RAPD technique indicated genetic polymorphism.

The study on utilization of Sewan (*Lasiurus indicus*) grass alone and in combination with Ardu leaves (*Ailanthus excelsa*) by camel calves showed positive benefit of Ardu tree leaves supplementation on nutrient utilisation and body weight gain.

Comparison of milking techniques (4 teat stripping v/s 2 teat stripping and allow calf to suck simultaneously) indicated that the various factors viz; month of lactation, breed, parity and method of milking are significant in daily milk production and lactation period could last for 16 months.

The bench mark survey of 64 camel keepers on Camel Husbandry practices in 4 villages of different Tehsils of Bikaner District. The main income source of farmers is from agriculture followed by camel carting especially in those villages which are located closer to the city/town.

Extension Activities:

Breeding input through superior quality Bikaneri studs was provided to the camels brought by camel keepers from near by villages during breeding season and studs were distributed to Panchayat Samiti through State Animal Husbandry Department, Rajasthan. Four new handouts in Hindi were released during this year.

□

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 with very good infrastructural facilities and a museum. The centre has generated substantial 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 range of sanddunes. 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 temperature ranges between 30°C to 45°C in summer season and between 4°C and 28°C in winter season. National Research Centre on Camel, Bikaner, is having about 257 camels of different age groups mainly belonging to Bikaneri, Jaisalmeri and Kachchhi breeds.

1.2. PAST ACHIEVEMENTS

- NRC on Camel has developed an elite camel herd consisting of Bikaneri, Jaisalmeri and Kachchhi breeds.
- Genetic parameters have been estimated for several traits of economic importance.
- Reduction in early calf mortality from 20-30% in field condition to around 5.0% under farm condition through improved management practices.
- Breeding efficiency of camel herd has been improved significantly in terms of age at first calving and calving interval.
- Random amplification of polymorphic DNA technique showed genetic variability in Indian dromedary camel.

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

1.3. MANDATE

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

1.4. ORGANOGRAM

The Organogram chart is provided in Fig. 1.4

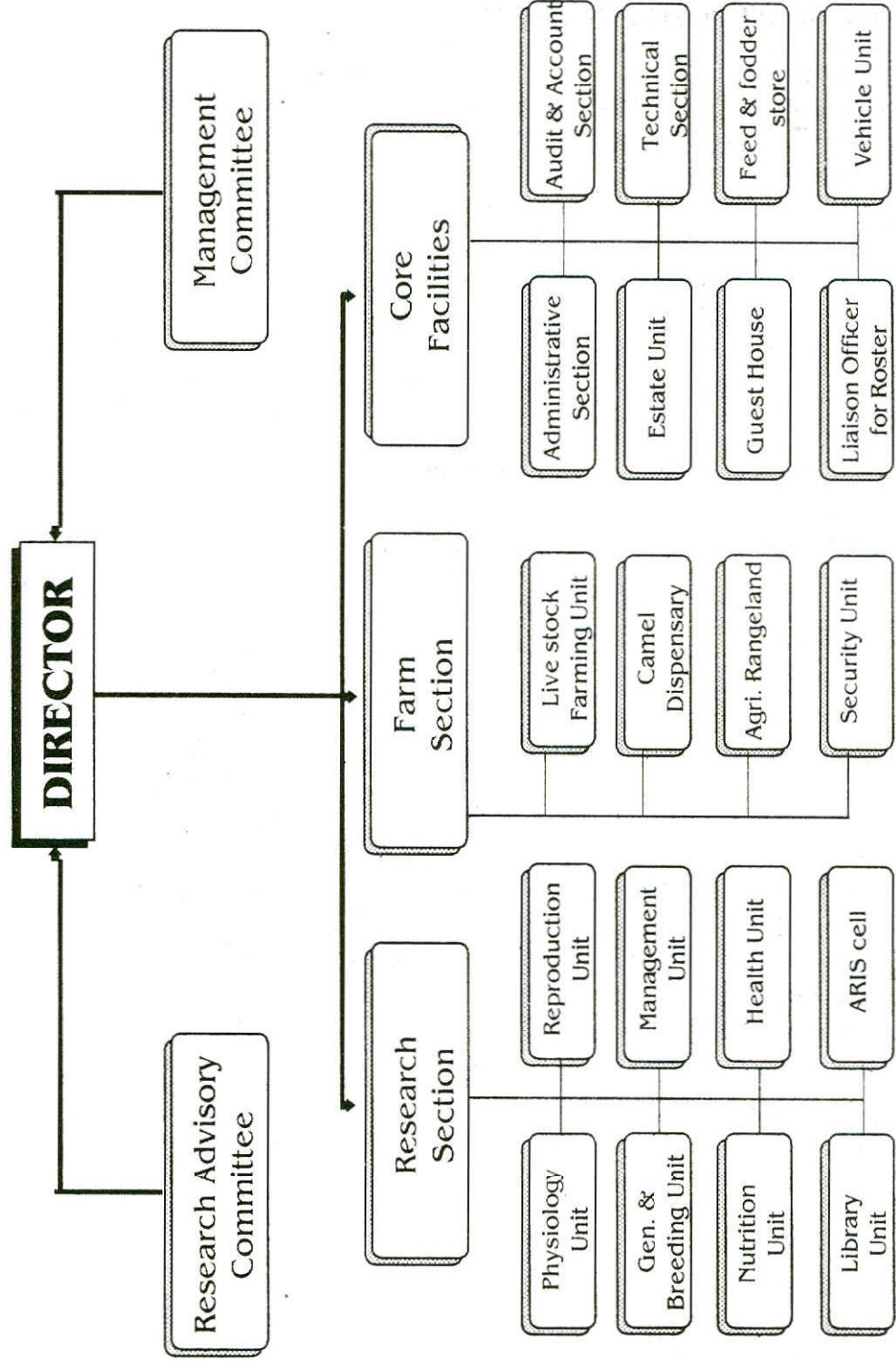
1.5. INFRASTRUCTURE :

The NRC on Camel has a Livestock 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.

- 1.5.1. **Livestock farm** : The farm maintains a herd of about 250 camels mainly comprising of three indigenous breeds viz. Bikaneri, Jaisalmeri and Kachchhi camels. The unit is equipped with one Camel dispensary and a Disease Diagnostic Laboratory, 6 sheds, 3 camel boxes, 1 metabolic shed and a shed with provision of individual feeding. The farm also has fodder and feed godown, one experimental feed pelleting plant and an electromechanical weigh bridge. Three camel corrals are under construction in the range land area.
- 1.5.2. **Laboratories** : NRC on Camel has modern laboratories in 2 different complexes. One complex has laboratories for Camel Physiology, Camel Genetics, Camel Reproduction, Camel Health, ARIS 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.
- 1.5.3. **Library** : The library subscribes around 29 journals and other abstracting services. Subjectwise reference database has been created along with photocopying facility.
- 1.5.4. **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 sindicus*) and Blue panic (*Panicum antidotale*).
- 1.5.5. **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.

Fig. 1.4 ORGANOGRAM

NATIONAL RESEARCH CENTRE ON CAMEL, BIKANER



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1.6. STAFF POSITION (1998-99)

Cadre	Sanctioned	In position	Vacant
RMP	1	1	-
Scientific	20	12	8
Technical Category III	4	4	-
Category II	8	7	1
Category I	11	11	-
Administrative	10	10	-
Supporting	22	22	-
Total	76	67	9

Name of the staff members (1998-99)

Director

Dr. M.S. Sahani

Scientific

Sr. Scientist (Animal Genetics & 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. Raghvender Singh

Scientist (Animal Biochemistry)

Sh. Gorakhmal

Scientist (Veterinary Parasitology)

Dr. Rajender Kumar (on study leave)

Scientist (Animal Genetics & Breeding)

Dr. B.P. Mishra

Scientist (Animal Biochemistry)

Miss Poonam Jayant

Scientist (Livestock Production Mgmt.)

Dr. Champak Bhakat

Scientist (Veterinary Medicine)

Dr. D. Suchitra Sena

Scientist (Animal Nutrition)

Dr. Nirmla Saini

Technical

Sr. Vety. Officer, T-8

Dr. U.K. Bissa

Livestock Farm Supdt., T-7

Dr. N. Sharma

Farm Manager, T-7

Sh. Ram Kumar

Vety. Officer, T-6

Dr. B.L. Chirania

Library Assistant, T-4

Sh. Ram Dayal

Computer Op./Programmer, T-4

Sh. Dinesh Munjal

Agriculture Assistant., T-II-3

Sh. M.K. Rao

Lab. Technician, T-II-3

Sh. Anand Bhati

Hindi Translator, T-II-3

Sh. Nemi Chand

Jr. Engineer, T-II-3

Sh. Manjeet Singh

Livestock Assistant, T-II-3

Sh. Mohan Singh

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Livestock Assistant, T-1-3
 Lab. Technician, T-2
 Livestock Assistant, T-2
 Lab Technician., T-1
 Drivers

Sh. Ram Chander
 Sh. Nand Kishore
 Sh. Radha Kishan
 Sh. Rameshwar Vyas
 Sh. Shivji Ram
 Sh. Prabhu Dayal
 Sh. Mehboob Hussain
 Sh. Rafiq Alam
 Sh. Mani Lal
 Sh. Satnam Singh
 Sh. Suraj Bhan Singh

Tube well operator

Administration

Asstt. Admin. Officer
 Asstt. Fin. & Accounts Officer
 Assistant
 Stenographer
 Jr. Steno
 Sr. Clerk
 Sr. Clerk
 Sr. Clerk
 Jr. Clerk
 Jr. Clerk
 Supporting

Sh. A.K. Mallick
 Sh. N.D. Sharma (on deputation)
 Sh. Kanwar Pal
 Sh. Ram Kumar
 Sh. Harpal Singh
 Sh. Ashok Yadav
 Sh. Jamil Ahmed
 Sh. Anil Kumar
 Sh. Vishnu Soni
 Sh. Krishan Kumar
 22

1.7. FINANCIAL STATEMENT AND REVENUE RECEIPT (1998-99)

SN	Head of accounts	Plan		Non-Plan	
		Budget	Expenditure	Budget	Expenditure
1	Estt. Charges	15.00	16.90	63.19	61.83
2	Wages	10.32	9.52	-	-
3	T.A.	0.08	0.08	0.50	0.50
4	HRD	1.00	0.94	-	-
5	Other charges including Equipment	68.60	64.81	15.00	13.51
6	Works	5.00	5.00	-	-
	Total	100.00	97.25	78.69	75.84
	Revenue Receipt	-	-	-	2.46

2. RESEARCH PROGRAMMES

2.1. Project title : To study work standards in camel and to associate work standards with physical, physiological and biochemical parameters

Project code : PI 86/1-ICN/L-50-5220
 Project Leader : Raghvendar Singh
 Associates : Nirmala Saini
 M.S. Sahani
 Brig. N.M. Singhvi (Visiting Scientist)

Sub project 1 : Identification, evaluation and selection of camel for race purpose

A total of 12 camels (six each from Jaisalmeri and Bikaneri breed) in two groups of male and female were selected randomly in age group of 4-5 years. All the camels were given basic riding and race endurance training for six month and monthly body weights were recorded (Table 2.1.1). On the basis of training performance, eight camels were selected finally for further race trials. The race trial of all the camels were assessed on 3 km straight kachha desert track. The average environmental temperature during race trial was $31.1 \pm 0.29^{\circ}\text{C}$. The maximum race speed of female and male Jaisalmeri and Bikaneri during trial was recorded as 29.4, 28.4, 27.4 and 27.9 km/h, respectively.

The cardinal physiological responses were recorded for female and male camels before and after race trial and are given in Table 2.1.2. The per cent increase in average respiratory frequency, pulse rate and osmolality during race trial were recorded 223 ± 17.0 , 62 ± 1.4 and 11 ± 2.8 in females and 17 ± 25 per min., 72 ± 2.4 per min and 7 ± 3.6 mm/l in male camel respectively. The blood samples were collected before and after race trial for biochemical analysis and data are given in table 2.1.3. The level of blood glucose increased by 98% in female and 58% in male camels. The levels of creatinine was observed significantly higher in male (62%) than females (22%). There was no significant change in lactate dehydrogenase and creatinine kinase activity.

Table 2.1.1. Month-wise average body weights of race camels (kg)

Months	Bikaneri		Jaisalmeri	
	Male	Female	Male	Female
March	399±37.5	402±18.0	431±34.3	391±2.6
April	387±22.6	379±14.9	428±42.6	374±2.9
May	356±21.3	380±14.4	430±33.9	386±7.4
June	371±17.1	417±19.4	443±35.4	421±9.4
July	393±19.1	387±13.6	468±33.0	437±29.9

Table 2.1.2. Cardinal and physiological responses of racing camels in Jaisalmeri and Bikaneri breeds

Breed	Sex		Respiration /min	Pulse /min	Osmolality /mM/L	Rectal Temp°C
Jaisalmeri	F	Before	10.5 ±0.29	56.5 ±2.02	358 ±6.33	36.6 ±1.55
		After	31.3 ±1.80	96.3 ±1.11	403±10.96	38.8 ±0.10
		% Change	198.0	70.0	13.0	6.0
Bikaneri	F	Before	9.5±0.28	58.5±1.71	352±8.11	36.8±0.19
		After	33.0 ±2.67	90.0±3.10	385±24.39	39.1±0.11
		% Change	247.0	54.0	6.0	9.0
Jaisalmeri	M	Before	10.5±0.65	58.5±1.55	322±7.71	36.8±0.31
		After	31.0 ±3.22	93.0 ±3.34	337 ±11.11	38.8 ±1.52
		% Change	195.0	59.0	5.0	6.0
Bikaneri	M	Before	11.0±0.58	54.8±2.28	322±7.33	37.0±0.24
		After	26.8±2.14	101.0±1.58	351±7.20	39.0±0.15
		% Change	144.0	84.0	9.0	5.0

Mean ± SE of four observations

Table 2.1.3. Blood biochemical response of racing camels in Jaisalmeri and Bikaneri breeds

Breed	Sex		Glucose mg/dL	Creatinine mg/dL	LDH IU/L	CK IU/L
Jaisalmeri	F	Before	110±23.3	2.4±0.19	414±27	65±19
		After	193 ±33.4	2.8±.24	429±34	58±23
		% Change	75.0	17.0	3.0	14.0
Bikaneri	F	Before	85 ±21	2.3± .16	347 ±16	46 ±9
		After	187±36	2.9 ±0.30	342±13	41±10
		% Change	120.0	26.0	(-)1.5	(-)11.0
Jaisalmeri	M	Before	108 ±6.0	3.6 ±0.62	352±26	45±4
		After	178 ±8.0	6.0 ±0.96	366±24	37 ±3
		% Change	65.0	66.0	3.0	(-)18.0
Bikaneri	M	Before	117±19.0	3.3 ±0.75	364±18	58 ±6
		After	176 ±8.0	5.2 ±0.63	390 ±15	51±7
		% Change	51.0	57.0	7.0	(-)13.0

Mean ± SE of four observations

Sub Project II. Evaluation of nutrient utilization in female race camel

Four young female camels of 346 kg average body weight were maintained on dry chaffed groundnut (*Arachis hypogea*) as a sole ration. After 20 days of adoption period, a 6 days metabolic trial was conducted. During this period, intake of feed and water was recorded and 24 h. faecal samples were collected. Representative sample of feed and faeces were analysed for proximate composition (Table 2.1.4). Required amount of DCP, TDN and ME intake were found to be 267 gm/day, 3.78 kg/day and 56.06 MJ/d respectively and TDNI was 47.08 gm/kg W^{0.75}. The water intake was 12.04 l/day and 95.40 ml/kg W^{0.82}

Table 2.1.4. Nutrient digestibility and intake in female race camel during rest period

Parameter	At rest
DMI (kg/day)	6.70±0.25
DMI (g/kg W ^{0.75})	83.87±2.53
DMI (kg/100 kg b.w)	1.90±0.57
Digestibility Coefficient	
DM	57.71±1.42
OM	63.12±0.88
CP	45.38±3.04
CF	61.28±1.85
EE	12.92±1.49
NFE	69.70±0.86

2.2. Project title : Studies on quantitative and qualitative genetic parameters in Indian camel

Project code no. : P.I. 86/2-ICN/L-10/5220
 Project leader : M.S. Sahani
 Associates : S.N.Tandon
 B.P. Mishra
 U.K. Bissa

Body weights and growth

G. Bhat

The breed and sex wise means of the body weights from birth to adult are presented in Table 2.2.1. The male calves were found to be heavier but significant difference was obtained in Kachchhi calves. In general the body weight of male animals were found to be heavier as compared to female and breed difference exhibited that Bikaneri camels are heavier followed by Kachchhi and Jaisalmeri breeds. The average daily weight gain up to 6 months of age in all the three breeds viz. Bikaneri, Jaisalmeri and Kachchhi have been computed. The daily weight gain was higher in calves from birth to 3 months age group as compared to calves between 3-6 months age.

Table 2.2.1. Breed, age and sex wise means of body weights (kg) in Indian Camel breeds (1998-99)

	Bikaneri		Jaisalmeri		Kachchhi		Pooled	
	Male	Female	Male	Female	Male	Female	Male	Female
Birth weight	39.00±2.06 (5)	38.80±1.79 (5)	38.50±1.15 (8)	38.33±2.09 (3)	40.00±0.00 (1)	31.00±0.00 (1)	38.78±1.43 (14)	37.78±3.67 (9)
1 month body weight	64.33±3.48 (6)	58.00±2.89 (5)	63.00±3.35 (8)	58.80±5.56 (5)	59.00±3.30 (4)	62.00±0.00 (1)	62.56±3.29 (18)	58.73±3.99 (11)
3 months body weight	114.50±8.81 (8)	107.00±4.29 (4)	111.25±5.90 (8)	106.17±8.31 (6)	98.00±5.09 (3)	106.00±4.62 (2)	110.53±7.23 (19)	106.42±6.19 (12)
1 year body weight	170.75±3.88 (8)	202.00±10.23 (3)	202.67±5.90 (6)	206.25±13.82 (4)	142.67±6.02 (3)	201.00±0.50 (2)	176.76±10.08 (17)	203.67±9.94 (9)
2 years body weight	219.00±7.19 (4)	269.20±13.86 (5)	237.20±4.46 (5)	235.00±7.51 (2)	248.00±0.00 (1)	282.00±0.00 (1)	231.00 (10)	262.25 (8)
3 years body weight	287.00±19.62 (6)	277.25±14.06 (8)	310.00±12.25 (3)	368.67±25.52 (3)	316.50±5.05 (4)	300.00±26.17 (3)	301.38 (13)	301.72 (14)
4 years body weight	363.00±19.76 (4)	348.67±16.27 (3)	421.00±5.01 (4)	-	422.00±0.00 (1)	-	395.33 (9)	348.67±16.27 (3)
Adult body weight	670.00±45.35 (14)	555.94±29.08 (36)	580.91±47.09 (11)	555.56±25.46 (16)	638.62±42.75 (8)	511.67±29.01 (9)	632.70 (33)	549.31 (61)

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Reproductive parameters

The per cent conception, calving rate, number of services per conception, gestation length and calving interval were presented in Table 2.2.2.

Bio-chemical polymorphism studies

The bio-chemical polymorphism studies were continued with the following protein/enzyme systems viz. haemoglobin, transferrin, amylase, alkaline phosphatase, acid phosphatase and lactate dehydrogenase using both starch gel and polyacrylamide gel electrophoresis. Polymorphism could not be recorded in any of the system.

Hair quality attributes

A total of 127 hair samples from 32 camels of 1 year and 3-4 years of age from three indigenous breeds viz., Bikaneri, Jaisalmeri and Kachchhi were analysed for staple length, mean fibre diameter and percentage of fibre types viz. pure, hetero, hairy and kemp (Table 2.2.3). The hair samples of annual clip were compared from four major body sites (shoulder, mid-side, hump and neck region). The clipping was done in the month of March. The data were analysed for breed, site, age and sex effect using mixed model least square and maximum likelihood programme. The mean staple length ranged between 3.8 cm to 11.6 cm and breed, site, age ($p < 0.01$) and sex ($p < 0.05$) had significant effect. The mean fibre diameter ranged between 25.66μ to 31.54μ . Yearling calves showed minimum fibre diameter as compared to other age group. Breed, sex, site and age effects were having significant effect ($p < 0.01$) on mean fibre diameter. Mean fibre diameter of pure, hetero, hairy and kempy fibres ranged between 20.08μ to 24.41μ , 26.04μ to 33.3μ , 36.27μ to 45.72μ and 58.50μ to 68.86μ respectively, while percentage of these fibres ranged between 38.56% to 43.49%, 34.57% to 40.95%, 16.66% to 20.56% and 2.22% to 3.61% respectively. The results revealed significant effect of breed on staple length and mean fibre diameter which indicated variability and scope for their improvement. The data also indicated that the fibre quality attributes of one year camel calves were superior to 3-4 years camels indicating better utility.

Table 2.2.2. Reproductive parameters of camel herd (1998-99)

Parameters	Bikaneri	Jaisalmeri	Kachchhi	Cross bred	Over all
Precent conception	80.00	72.00	85.71	Nil	77.42
Percent calving rate	81.25	73.33	75.00	100.00	78.38
Number of services per conception	2.29	1.72	2.00	-	2.04
Gestation length (days)	389.54± 2.58 (11)	390.63± 2.18 (9)	388.00± 3.08 (3)	-	389.78± 2.67 (23)
Calving interval (days)	735.29± 18.96 (7)	712.00± 30.61 (6)	733.33± 27.69 (3)	N.A.	726.00± 21.03 (16)

Table 2.2.3. Breed, Sex, Site and Age group wise L.S.Q. means of Hair attributes of Dromedary Camels

Breed	Staple length (cm)	Mean fibre Diameter μ \pm S.E. (n)	Least square Mean Fibre Diameter (μ)				Percentage of Fibre			
			Pure	Hetero	Hairy	Kemp	Pure	Hetero	Hairy	Kemp
Bikaneri	6.89 \pm 0.20 (68)	27.22 \pm 0.3 7 (68)	20.41 \pm 0.4 1 (68)	26.48 \pm 0.3 7 (68)	37.31 \pm 0.6 9 (68)	67.54 \pm 1.0 8 (66)	41.50 \pm 0.3 1 (63)	36.84 \pm 0.5 8 (68)	18.14 \pm 0.6 2 (68)	3.61 \pm 0.2 7 (66)
Jaisalmeri	6.29 \pm 0.2 3 (51)	27.45 \pm 0.4 3 (51)	22.06 \pm 0.4 7 (51)	26.04 \pm 0.4 3 (51)	40.03 \pm 0.7 9 (51)	68.25 \pm 2.5 3 (15)	40.62 \pm 0.8 2 (51)	37.84 \pm 0.6 7 (51)	20.56 \pm 0.7 2 (51)	2.22 \pm 0.41 (15)
Kachchhi	4.97 \pm 0.64 (8)	30.99 \pm 1.1 6 (8)	23.53 \pm 1.2 7 (8)	33.30 \pm 1.1 7 (8)	45.65 \pm 2.1 5 (8)	-	43.49 \pm 2.2 2 (8)	38.60 \pm 1.8 2 (8)	17.68 \pm 1.9 4 (8)	-
Sex										
Male	5.72 \pm 0.25 (68)	27.81 \pm 0.4 5 (68)	21.14 \pm 0.4 9 (68)	27.57 \pm 0.4 5 (68)	40.37 \pm 0.8 3 (68)	67.99 \pm 1.5 3 (42)	40.67 \pm 0.8 6 (68)	38.58 \pm 0.7 0 (58)	19.01 \pm 0.7 5 (68)	3.06 \pm 0.25 (42)
Female	6.38 \pm 0.31 (59)	29.30 \pm 0.5 6 (59)	22.86 \pm 0.6 2 (59)	29.64 \pm 0.5 7 (59)	41.63 \pm 1.2 4 (59)	67.80 \pm 1.8 9 (39)	43.07 \pm 1.0 8 (59)	36.94 \pm 0.8 8 (59)	18.57 \pm 0.9 4 (59)	2.77 \pm 0.31 (39)
SITE										
Shoulder	4.69 \pm 0.35 (32)	27.85 \pm 0.6 3 (32)	21.80 \pm 0.6 9 (32)	27.29 \pm 0.6 3 (32)	40.23 \pm 1.1 7 (32)	68.17 \pm 2.1 6 (21)	41.97 \pm 1.2 1 (32)	37.30 \pm 0.9 9 (32)	19.56 \pm 1.0 6 (32)	2.38 \pm 0.35 (21)
Mid-Side	4.11 \pm 0.35 (32)	26.73 \pm 0.6 3 (32)	20.74 \pm 0.6 9 (32)	26.30 \pm 0.6 3 (32)	39.04 \pm 1.1 7 (32)	67.82 \pm 2.3 3 (19)	41.81 \pm 1.2 1 (32)	37.25 \pm 0.9 9 (32)	19.65 \pm 1.0 6 (32)	2.71 \pm 0.38 (19)
Hump	11.60 \pm 0.3 5(31)	31.18 \pm 0.6 4 (31)	24.41 \pm 0.7 0 (31)	31.70 \pm 0.6 4 (31)	42.15 \pm 1.1 9 (31)	68.86 \pm 2.0 5 (22)	40.22 \pm 1.2 3 (31)	38.34 \pm 1.0 0 (31)	19.29 \pm 1.0 7 (31)	3.22 \pm 0.33 (22)
Neck	3.80 \pm 0.35 (32)	28.45 \pm 0.6 3 (32)	21.06 \pm 0.6 9 (32)	29.14 \pm 0.6 4 (32)	42.56 \pm 1.1 7 (32)	66.73 \pm 2.2 0 (19)	43.48 \pm 1.2 1 (32)	38.14 \pm 0.9 9 (32)	16.66 \pm 1.0 6 (32)	3.36 \pm 0.36 (19)
AGE										
1 Year	5.56 \pm 0.30 (67)	25.66 \pm 0.5 5 (67)	20.08 \pm 0.6 1 (67)	26.16 \pm 0.5 5 (67)	36.27 \pm 1.0 2 (67)	58.50 \pm 1.3 6 (52)	45.18 \pm 1.0 6 (67)	34.57 \pm 0.8 7 (67)	18.29 \pm 0.9 2 (67)	3.33 \pm 0.22 (52)
4 Year	6.55 \pm 0.25 (60)	31.45 \pm 0.4 6 (60)	23.93 \pm 0.5 1 (60)	31.05 \pm 0.4 7 (60)	45.72 \pm 0.8 6 (60)	77.29 \pm 2.0 9 (29)	38.56 \pm 0.8 9 (60)	40.95 \pm 0.7 3 (60)	19.29 \pm 0.7 8 (60)	2.50 \pm 0.34 (29)
OVER ALL	6.05 \pm 0.23 (127)	28.55 \pm 0.4 2 (127)	22.00 \pm 0.4 7 (127)	28.61 \pm 0.4 3 (127)	41.00 \pm 0.7 9 (127)	67.90 \pm 1.4 0 (81)	41.87 \pm 0.8 1 (127)	37.76 \pm 0.6 6 (127)	18.79 \pm 0.7 1 (127)	2.91 \pm 0.23 (81)

*P<0.05 ** P<0.01 N.S. = Not Significant

Sub project I : Molecular genetic studies in Indian camel

P.I. : B.P. Mishra
Associates : S.N. Tandon
M.S. Sahani

1. DNA cleavage profile of *Camelus dromedarius*

Genomic DNA from 3 camel breeds viz. Bikaneri, Jaisalmeri & Kachchhi maintained at NRC on Camel was isolated from blood leukocytes. The blood samples were taken from both male and female camels of the above 3 camel breeds. The purity of genomic DNA samples was checked by spectrophotometry and integrity was checked in 0.7% agarose gel electrophoresis which showed single intact high molecular weight genomic DNA band.

Genomic DNA sample of both male and female animals from 3 breeds were cleaved with restriction enzyme *Hinf I*, *Pst I*, *Pvu II*, *Eco RI* and *Bam HI*. Restriction enzyme digestion was carried out at 37°C overnight with 5 to 10 units enzymes/mg of genomic DNA in manufacturer's recommended assay buffer. Restriction cleavage products were analyzed on 0.8% agarose slab gels in TAE buffer system for 10-12h at 40-60 constant volts. Known lamda Hind III phage DNA marker was run in parallel to ascertain the molecular size of repetitive DNA bands. Restriction cleavage analysis indicated variable repetitive DNA bands in various enzymes tested. *Eco RI* and *Bam HI* cleavage profile didn't show any repetitive DNA bands of camel genomic DNA and thus confirmed the earlier results. Three enzymes viz. *Hinf I*, *Pst I* and *Pvu II* revealed 8, 6 and 2 repetitive DNA bands of variable sizes in camel genomic DNA (Figure 2.2.1, Table 2.2.4). *Hinf I* enzyme demonstrated as many as 8 bands ranging from 0.6 to 2.29 kb and close observation of molecular size of DNA bands indicated the presence of a periodicity spanning approximately 20-30 bp. *Pst I* yielded 6 bands ranging from 0.33kb to 1.74kb with a similar periodicity among the repetitive DNA bands. The presence of periodicity of repetitive DNA bands was also earlier reported earlier in other animal species.

Table 2.2.4. Repetitive DNA bands of *Camelus dromedarius*

Restriction Enzyme	No of Repetitive DNA bands	Molecular size(Kb)
<i>Hinf I</i>	8	0.6, 0.8, 1.05, 1.32, 1.58, 1.91, 2.09, 2.3
<i>Pst I</i>	6	0.33, 0.57, 0.83, 1.05, 1.45, 1.74
<i>Pvu II</i>	2	0.25, 0.5
<i>Eco RI</i>	No bands	
<i>Bam HI</i>	No bands	

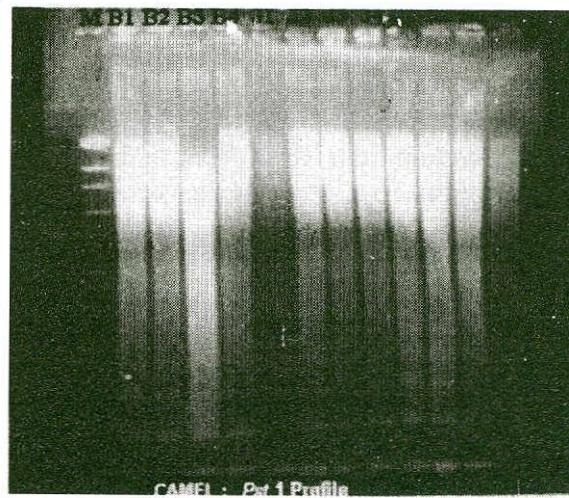


Fig 2.2.1 *PstI* restriction enzyme cleavage profile of camel genomic DNA showing repetitive DNA bands.
B : Bikaner, J : Jaisalmeri, K : Kachchhi

The restriction enzyme *Pvu II* demonstrated 2 clear repetitive DNA bands of 0.25 and 0.5 kb which was different in other animal species (Fig. 2.2.2). Comparison of sex and breeds indicated no sex or *intra* and *inter* breed differences in repetitive DNA bands across all the enzymes tested. Restriction enzyme cleavage profile showed no variation between sexes and breeds.

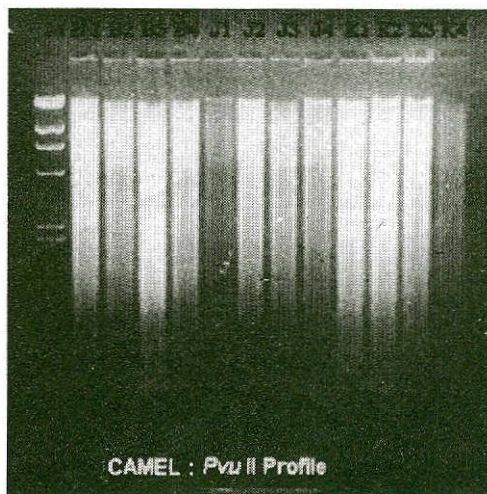


Fig 2.2.2 *PvuII* restriction cleavage profile of camel Genomic DNA.
B : Kikaner, J : Jaisalmeri, K : Kachchhi

Repetitive DNA analysis will further enumerate the organization, nature of repetitive DNA in camels and will also help to locate the satellite sequence on camel genomic DNA.

2. Genetic variability in *Camelus dromedarius* using Polymerase Chain Reaction (PCR) based Random Amplification of Polymorphic DNA (RAPD) technique.

In continuation to our earlier research trials we have extended the use of random primers in studying genetic variability in 3 major Indian camel breeds viz. Bikaneri, Jaisalmeri and Kachchhi. The animals were selected at random from NRCC herd and genomic DNA was isolated from blood leukocytes. Random arbitrary 10 oligomer primers were custom synthesized and used in PCR-RAPD technique to amplify RAPD markers in camel. Three primers viz. GT-10, OP-08 and G-2 revealed reproducible RAPD pattern of camel genomic DNA. Molecular length of RAPD band are presented in Table 2.2.5. Overall 6 to 10 bands were observed in agarose gels with different oligos tested. The G-2 revealed 6 DNA bands with no genetic polymorphism among 3 breeds. However, GT-10 primer was found to be the most informative in camel which indicated *intra* and *inter* breed genetic polymorphism in camel (Figure 2.2.3). This result further strengthen our earlier reports on GT-10 which may prove to be a useful RAPD marker in genetic characterization/ breed characterization of *Camelus dromedarius*. One new primer designated OP-08 was found informative in Indian camel breeds yielding 5 polymorphic band among 10 DNA bands.

Table 2.2.5. PCR-RAPD markers in *Camelus dromedarius*

G-2	GT-10	OP-08
2.19	2.09	1.62
1.55	1.76	1.4*
1.41	1.66*	1.35
1.32	1.57	1.27*
1.15	1.40	1.12*
1.05	1.32	0.89*
	1.12*	0.75*
	0.91	0.71
	0.75*	0.69
		0.53

* Polymorphic DNA bands

Note : DNA bands are presented in kb.

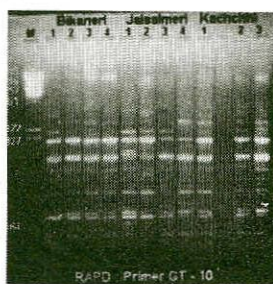


Fig 2.2.3 PCR-RAPD profile of camel Genomic DNA.

B : Kikaner, J : Jaisalmeri, K: Kachchhi

Sub Project II : Milking technique and other factors affecting milk production potential and lactation length in camels

P.I. : Gorakhmal
Associates : B.P. Mishra
M.S. Sahani

Milk production in 5 lactating camels each of Bikaneri, Jaisalmeri and Kachchhi breeds and belonging to first, second and third parity was recorded. Milk yield was recorded at 12h interval daily. Two milking techniques i.e. a) Simultaneous milking of 4 teats by hand stripping and b) Two teat milking of one side and allowing calf to suckle the other two teats for better let-down were adopted.

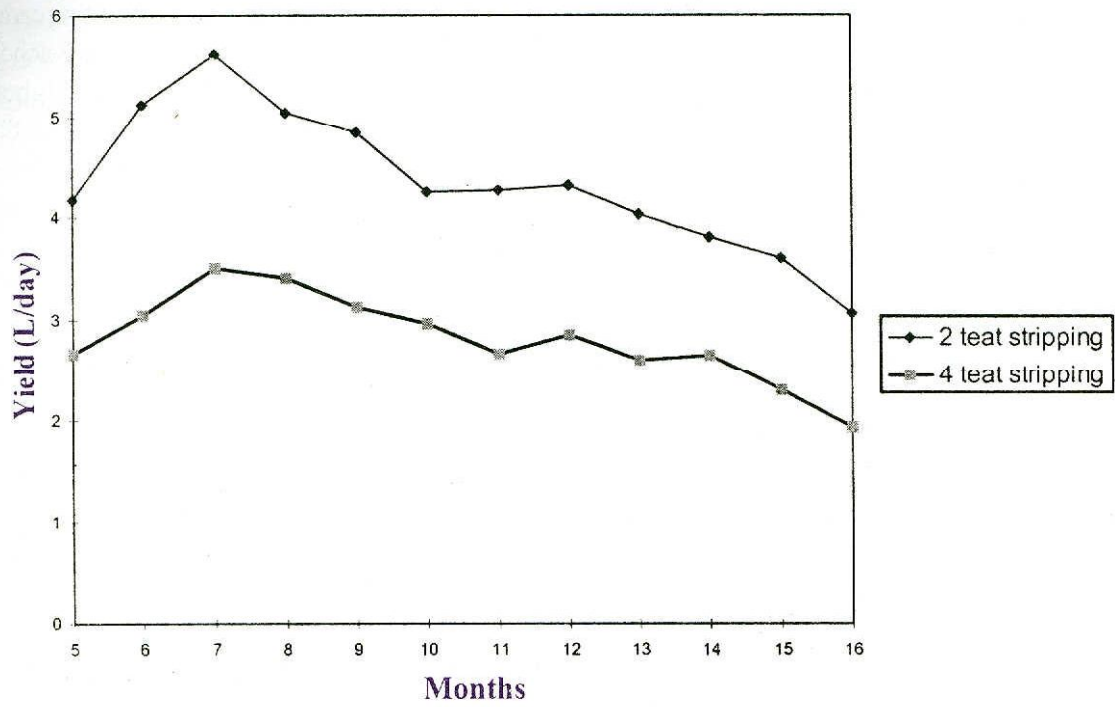
The average daily milk production by 4-teat and 2-teat stripping in Bikaneri lactating camels were 2.80 ± 0.17 and 3.98 ± 0.32 l/day, in Jaisalmeri 2.60 ± 0.17 and 3.90 ± 0.34 l/day and in Kachchhi 3.04 ± 0.17 and 4.12 ± 0.35 l/day respectively. The milk production was found to be higher in Kachchhi camels followed by Bikaneri and Jaisalmeri under both the techniques. The total daily milk production was higher with 2-teat compared to 4-teat stripping. The effect of breed was significant ($P < 0.05$) for total milk production in 4-teat stripping. The daily average of first, second and third parity lactating camels with 4-teat stripping method were 2.19 ± 0.13 , 1.96 ± 0.26 and 3.07 ± 0.18 l/day, while, under 2-teat stripping were 2.82 ± 0.20 , 2.62 ± 0.38 and 4.32 ± 0.13 l/day respectively. The effect of parity was significant ($P < 0.01$) for total production under both the milking techniques. The month-wise average daily milk production (Fig. 2.2.4) under 4-teat stripping varied from 1.90 ± 0.26 to 3.51 ± 0.27 l/day, with 2-teat stripping from 3.06 ± 0.43 to 5.62 ± 0.42 l/day. The month-wise daily milk production under both the techniques indicated significant ($P < 0.01$) variation. The average daily milk production by 2 and 4-teat stripping was highest during month 7 of lactation. These findings clearly reflect that Indian camel breeds possess milk production potential and significant contribution of various factors such as stage of lactation, breed, parity and stage of milking. The lactation period could last for 16 months.

2.3. Project Title : To develop suitable management practices for rearing camel

Project code : PI 86/3-ICN/L-50/5220
Project leader : S.N. Tandon
Associates : Champak Bhakat
M.S. Sahani
B.L. Chirania

A bench mark survey was carried out in four different villages viz Bajju, Lakhusar, Keshardeshar and Gadwala from four different tehsil of Bikaner district. In all villages camels are reared under semi intensive system of management. The analysis of data revealed that the average

Fig. 2.2.4. Month-wise average daily milk production of lactating camels using different milking techniques



family size ranged from 6.86 to 7.76 with average of 7.29 and females members exceeded the males. The literacy percentage was higher in Gadwala village which is nearer to Bikaner city as compared to other villages (Fig. 2.3.1). In all villages the percentage of marginal farmers varied from 90.91 to 96.15% and the progressive farmers from 3.85 to 8.00%. The ratio of cattle or other herbivora was maximum in Gadwala followed by Lakhusar, Bajju and Kesardesar (Fig. 2.3.2).

Under irrigated area the main crops of rabi season are mustard, chana, wheat and of kharif season are guar (*Cyamopsis tetragonoloba*), moth (*Phaseolus aconitifolius*), bajra and til. In Kesardesar, Mung and cowpea are also cultivated in small scale. The Bikaneri camels are predominant in these area and few Jaisalmeri type of camels are also seen. The female members of family contributed maximum time to camel rearing than male members in all the 4 villages.

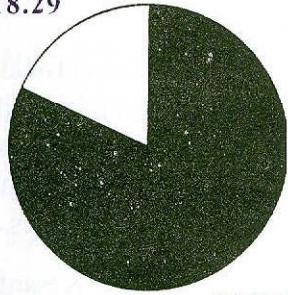
Camel trade is not a regular practice in these villages except to some extent in Kesardesar village. The carting operation in all the villages is carried out by camel keepers and most common type of loads are fuel wood, crop yield, water, vegetables etc. The period of carting per day varies from 8 to 10h depending upon the nature and urgency of work. The annual ploughing days by camel is about 60 days i.e. 30 days each in rabi and kharif season. On an average the ploughing by camel is done for 9-10h per day. The lactation length varies from 8 to 9 months. Milk is primarily utilised for calf feeding. Some camel keepers of Kesardesar village informed that in small extent camel milk is also used for the treatment of enteritis. The average annual hair yield of camel calf is higher than adult camel in all villages but reverse report was obtained from Lakhusar. The common fodders used in these area are moth chara (*Phaseolus aconitifolius*), guar phalgathi (*Cyamopsis tetragonoloba*). In case of special feeding maximum farmers were offering gur, oil, Alum, Azoan and some farmers were offering ghee, methi, haldi to their stud and breeding female. The frequency of watering is twice in summer but once in rainy and winter season.

The common breeding season and rutting months are November to March. The average number of services per conception varies from 1.72 ± 0.14 in Gadwala to 2.22 ± 0.15 in Bajju village (Table 2.3.1).

The camels in these villages are mainly suffering from parasitic mange. There is occasional incidence (10-20%) of trypanosomiasis. No prophylactic measure was adopted in villages. Although dermatitis treatment by Ivermectin injection is reported only from Gadwala village. The mortality in young calves ranges from 21.34 to 38.09% and in adult 4.21 to 7.00%. The ethno-veterinary practices revealed for the treatment of dermatitis Sesame oil/mobile oil/Kerosene oil + Boric powder. BHC was used in all the villages and for Khurak (Respiratory disease) Gur + Azoan was given.

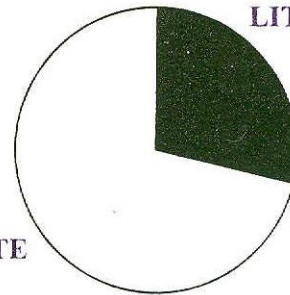
Fig 2.3.1 The Literacy (%) in different villages

ILLITERATE
18.29



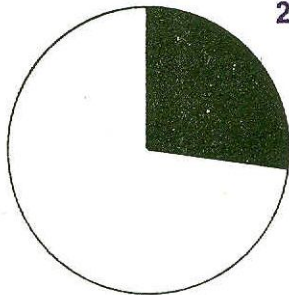
80.77
LITERATE

LITERATE
29



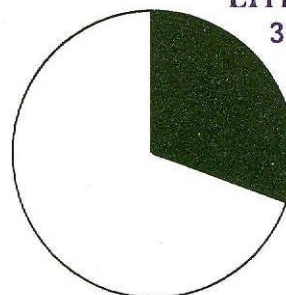
ILLITERATE
71

LITERATE
27.27



ILLITERATE
72.73

LITERATE
30.77



ILLITERATE
69.73

Fig. 2.3.2 the Species wise % composition of different livestock in villages

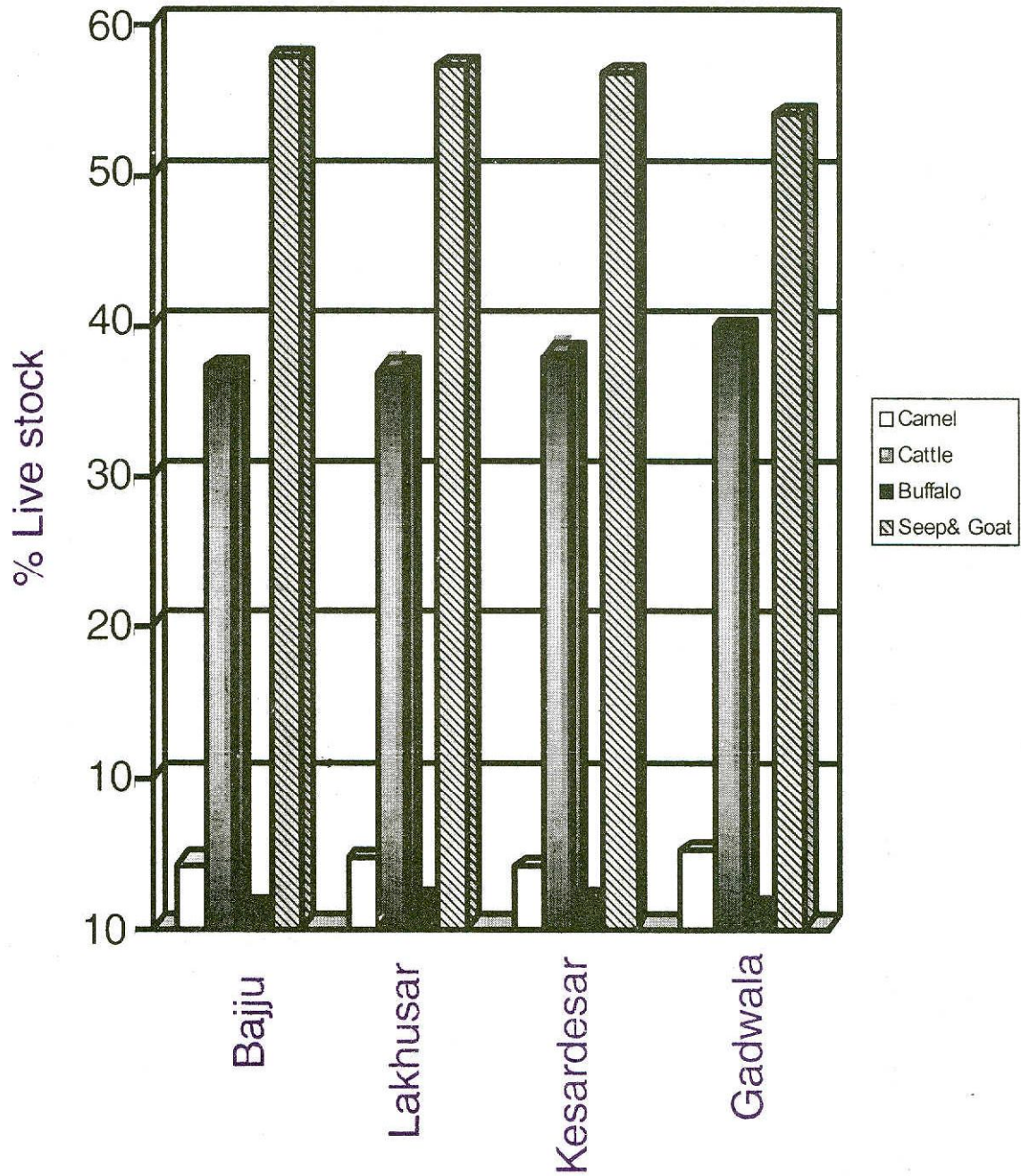


Table 2.3.1. The comparative analysis of camel breeding practices in different villages

Sl. No	Parameters Number of farmers interviewed ®	Bajju	Lakhusar	Kesardesar	Gadwala
1.	Common Breeding Season	November - March	November - March	November - March	November - March
2.	Average number of service /conception	2.22±0.15	1.93±0.16	2.09±0.31	1.72±0.14
3.	Average age at 1st breeding (years)	4.49±0.61	4.56±0.23	4.61±0.73	4.55±0.13
4.	Average age at 1st calving (years)	5.51±0.57	6.02±0.25	5.84±0.81	5.81±0.67
5.	Average Weaning Age (months)	9.52±0.89	8.38±0.70	8.02±0.81	7.42±1.38
6.	Common Rutting Months	November - March	November - March	November - March	November - March

Table 2.3.2. The economic analysis of camel rearers in different villages (Rs./Year/Animal)

Sl. No	Parameters Number of farmers interviewed ®	Bajju	Lakhusar	Kesardesar	Gadwala
1.	Animal Husbandry				
a.	Cattle & Buffalo	15,330.00	14,020.00	16,488.00	17,728.00
b.	Sheep & Goat	887.00	1,351.00	1095.00	712.00
c.	Camel	22,375.00	39,420.00	29,200.00	41,555.25

The economic analysis of camel rearers in different villages is presented in Table 2.3.2.

Another survey was conducted on organoleptic study of camel milk during camel festival 1999 at NRCC, Bikaner. A total of 75 visitors were interviewed for the acceptability of camel milk, out of whom 45 were Indians and 30 were foreigners. "Good Taste" - reported by maximum number (96.67%) of foreigners as compared to Indian (75.56%). The intention of retaking camel milk was more in foreigners (83.33%) than Indian (68.89%).

The camel business in different animal fair of Rajasthan is presented in Fig. 2.3.3.

The observations made in intensive farming system during August to October (Timing 8 AM to 4 PM) were presented in Table 2.3.3.

Table 2.3.3. Observations on intensive farming system (August to October) Timing 8 AM to 4 PM

Observations	Pregnant	Under lactation	Studs
Average feeding time (min)	132.08±20.22	145.18±17.94	117.64±17.56
Feeding Cycle (min)	5-15	3-18	5-20
Regurgation (min)	10-20	10-20	10-25
Watering	Once (7-15 min)	Once (7-15 min)	Once (7-15 min)
Sitting			
a. Lateral posture (hrs)	2-3	1-2	2-3
b. Common average (% time)	40-50	20-30	40-50
Standing or walking (% time)	40-60	50-60	30-40

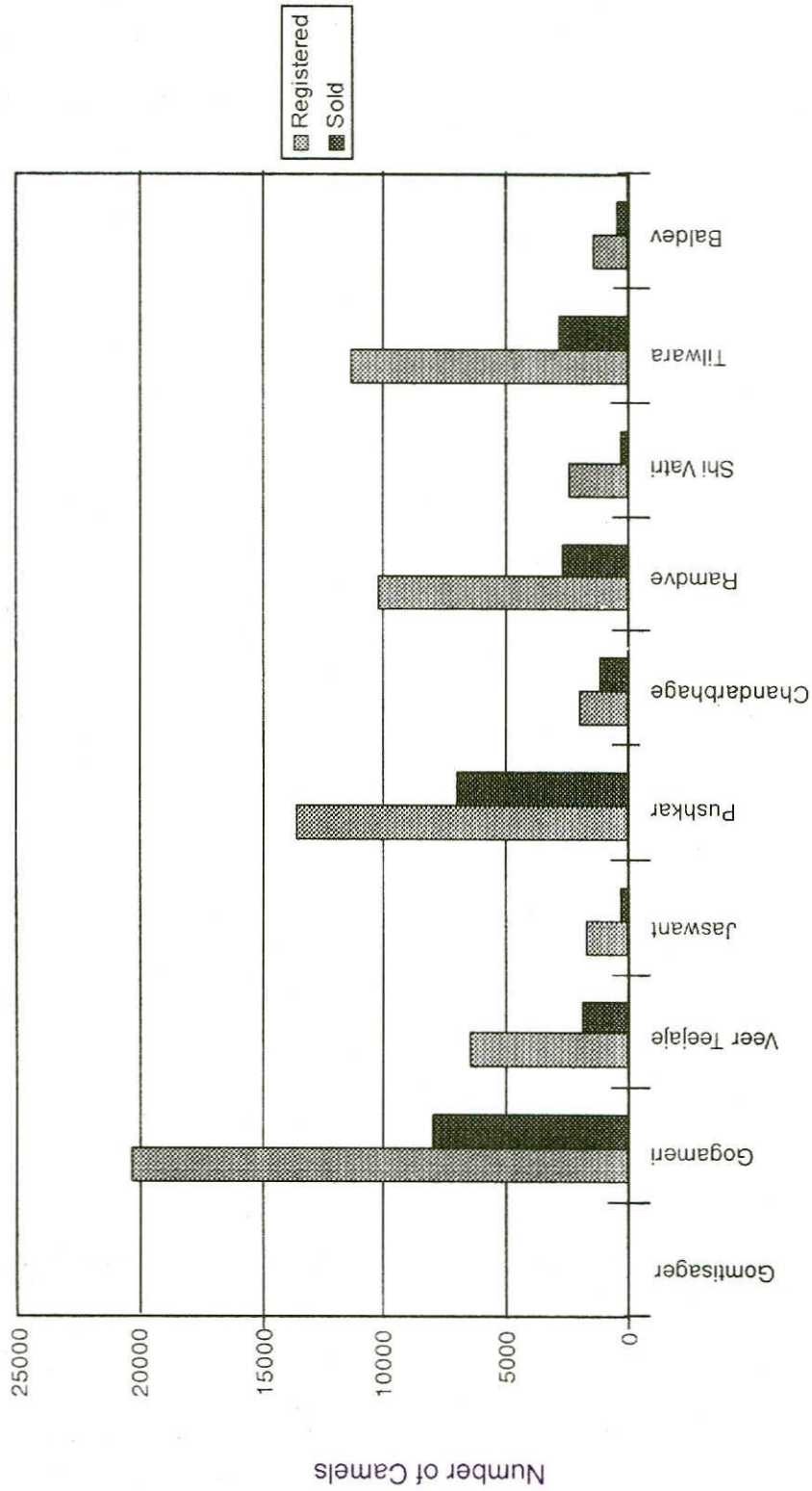
2.4. Project Title : Studies on camel nutrition

Project code : PI - 90/4 - ICN/L - 5220
 Project Leader : A.K. Nagpal
 Associates : Nirjala Saini
 M.S. Sahani

Sub Project I : Effect of supplementation on nutrient utilization and serum profile in adult male camels during rutting season

Six adult camel studs were maintained on dry chaffed fodder moth chara (*Phaseolus aconitifolius*) during winter for 68 days. The camel studs (3) in group II (experimental) were daily given 2 kg pellet concentrate supplement while those (3) in group I (control) were given 0.5 l Til oil and 1.0 kg Gur. Due to rutting, all the camels tended to loose their body weights (Table 2.4.1).

Fig. 2.3.3 Camel business in different animal fairs 1998
of Rajasthan



ANIMAL FAIRS

The average loss in body weight was higher in group I camels (40 kg) than in group II (15 kg) over 68 days period of experimentation. This could be due to low dry matter intake (DMI). Digestibility of CP and CF were lower while OM, EE and NFE were higher in group I than in group II. Higher ME intake and low CP intake in group I was observed as compared to group II on account of difference in the feed quality. Higher water intake in group II was related with higher DMI. Apparent absorption of all macro minerals viz., Na, K, Ca, P and Mg was lower in group I. The absorption of P was negative (-41.63%) in group I due to low dietary P intake (4.73 g/d) as compared to higher dietary P intake (30.6 g/d) in group II. Serum profile revealed higher levels of haemoglobin, total protein, albumin, urea as well as serum electrolytes (Na, K, Ca, P and Mg) in group II than in group I which could be due to the difference in feed quality (Table 2.4.2). Higher cholesterol and triglyceride levels could be due to til oil/jaggery supplementation.

Table 2.4.1. Body weight changes, nutrient intake and their utilisation in camel studs during rutting season

Parameters	Group I	Group II
Initial body weight (kg)	660.00±38.02	649.00±50.38
Final body weight (kg)	620.00±25.32	632.00±43.33
Average loss in Body weight (kg)	40.00±15.62	15.67±15.56
DMI (kg/d)	4.13±0.32	5.31±0.17
DMI (g/kg W ^{0.75})	33.00±2.14	42.48±2.97
DMI (kg/100 kg body weight)	0.66±0.04	0.85±0.07
Nutrient digestibility (%)		
DM	59.14±4.18	59.96±2.35
OM	74.83±3.31	69.55±1.50
CP	47.35±5.53	64.32±2.52
EE	92.13±0.32	57.60±2.64
CF	46.63±7.42	53.14±4.42
NFE	79.61±3.07	74.74±0.72
Nutrient intake		
DCPI (g/d)	156.67±27.28	480.00±20.00
TDNI (kg/d)	4.62±0.28	3.46±0.08
ME (MJ/d)	68.86±4.25	51.49±1.22
DCPI (g/kg W ^{0.75})	1.26±0.22	
TDNI (g/kg W ^{0.75})	37.01±2.83	27.58±1.23
ME (MJ/kg W ^{0.75})	0.55±0.03	0.41±0.02
Water intake (l/d)	8.17±1.34	11.47±0.50
Water intake (ml/kg W ^{0.82})	41.31±5.86	58.24±2.33

Table 2.4.2. Haemoglobin and serum bio-chemical profile of camel studs during rutting season

Parameters	Group I	Group II
Haemoglobin (g/dl)	9.52±0.71	11.73±0.13
Glucose (mg/dl)	108.49±4.40	108.85±5.04
Total Protein (mg/dl)	4.86±0.05	6.16±0.04
Albumin (mg/dl)	2.50±0.24	3.35±0.07
Urea (mg/dl)	29.10±7.14	52.77±2.22
Cholesterol (mg/dl)	23.33±1.70	17.66±0.44
Triglycerides (mg/dl)	5.31±1.24	2.89±0.27
Sodium (meq/l)	138.33±2.73	145.67±2.67
Potassium (meq/l)	4.07±0.07	4.17±0.22
Calcium (mg/dl)	8.86±0.35	10.00±0.95
Phosphorus (mg/dl)	3.29±0.13	3.40±0.20
Magnesium (meq/l)	2.31±0.25	3.65±0.29

2.5. Project title : Studies on Camel Reproduction

Project code : P.I.90/ 5 ICN/ L 31/ 5220

P.I. : Sumant Vyas

Associate : M.S. Sahani

Sub Project I : Studies on ovarian activity and breeding during early post-partum period

The present experiment was carried out to study the ovarian status in post parturient she camels. The main objective was to explore the possibility of mating such she camels depending on availability of follicle of suitable size.

Seventeen adult pluriparous, lactating she camels belonging to herd of N.R.C. on camel, Bikaner and parturited in the breeding season 1997-98 were taken for the experiment . The animals were examined on day 30, 45, 60, 75 and 90 days post partum for ovarian status using endovaginal probe (5 MHz) of ultrasound scanner-200.

The ovaries of eight animals did not reveal presence of follicle up to 90 days post partum. The presence of follicle >1.0 cm in diameter could be observed in rest of the nine animals (52.94%) animals. In these animals follicles were observed between 34 and 70 days post partum with an average of 56±3.37 days. The presence of follicle was not always associated with sexual receptive behaviour in females. The animals with follicular activity did not show sexual affinity and receptivity to male and sometimes resent the mating by males. Four animals (J 370, B353, B294, and J344) out of nine conceived and pregnancy was confirmed upon rectal examination after 60 days.

Sub Project II : Induction of early puberty in camel heifers

In camel, the age at puberty has been reported to be 4-6 years. Late puberty reduces the lifetime production. In this investigation, the effect of Porcine F.S.H.- Pituitary (Super-OV, AUSA International, U.S.A.) and Clomiphene citrate (Siphene, Serum international, India) was observed on induction of ovarian activity and fertility in prepubertal she camels.

Nineteen prepubertal she camels of three years (± 2 months) of age were divided into three groups. Group I (eleven animals) and group II (four animals) were administered 250 mg of 17-alpha Hydroxyprogesterone Caproate (Duraprogen, Unichem, India) on day one. In Group I a total of 37.5 i.u. of Super-OV was administered from 8th to 11th day (four days) twice daily in decreasing order. In group II, Clomiphene citrate, 100 mg daily was administered for five days (day 8 to day 12). The animals were examined for ovarian status with endovaginal annular transducer (5 MHz) of ultrasound scanner-200 (Philips Medicals, India) daily from day 12 onwards. The animals possessing follicle measuring 1.0 cm or more in diameter in either of ovaries were mated with virile stud on two successive days. The H.C.G. 5000 i.u. (Profasi-500, Serono, Italy) was administered at the time of mating, to facilitate ovulation. Animals in Group-III (four) were injected with sterile saline solution and served as control.

All animals in Group I responded to the treatment and eight out of eleven heifers conceived. Only one animal responded to the treatment in Group II but it did not conceive. None of the animal in control group expressed follicular growth during the period of study.

Sub Project III : Non Seasonal Breeding

An experiment was conducted in May and June 1998 to explore the possibilities of nonseasonal breeding in order to improve the reproductive efficiency. In all, 25 adult dry she camels were observed for reproductive behaviour and screened for follicular status of ovaries by ultrasound scanner. The dominant follicle was observed in ovaries of 56 % (14/25) of the she camels. Two females became pregnant after mating.

This study also indicated that there is need to improve reproductive efficiency of male camels during summer or non breeding season.

- 2.6. **Project title** : **Surveillance, monitoring and control of camel diseases**
P.I. : Rajender Kumar
Associates : D. Suchitra Sena
Gorakhmal
M.S. Sahani

Sub Project I : Epizootiological and clinical trial of mange in camel

The per cent incidence and epizootiology in relation to age, sex and breed at the farm camel herd of NRCC during 1991-1997 were presented in Table 2.6.1.

Incidence in relation to age and sex showed significant variation while there was no variation among breeds. Highest infection was noticed during September to December (59%) compared to January to April (22%) and May to August (19%).

The clinical signs and lesions noticed in mange camels were alopecia, scab formation, thickened corrugated skin. Lesions were mainly noticed on ventral surface of body, tail, lips, flank, neck, face, axillary regions and inner surface of limbs.

The clinical trial was conducted among 4 groups of 4 animals each.

Group I* : Single topical application of Himax lotion.

Group II* : Topical application of Himax ointment thrice at 5 day interval.

Group III : Amitraz 12.5% solution as spray @ 10 ml in 5.0 lts of water twice at weekly intervals.

Group IV : Control group.

* Also given teeburb capsules @ 4 caps b.i.d. for 15 days per os.

The mean haematological parameters both prior to and after therapy in all the groups were presented in Table 2.6.2. Hypohaemoglobinaemia, leucocytosis, neutropenia, eosinophilia and monocytosis were noticed in mange camels which returned to within the normal range post therapy.

The mean biochemical parameters prior to and after therapy were presented in Table 2.6.3. A decrease in Alanine transaminase (ALT), Aspartate transaminase (AST), Alkaline phosphatase (ALP), urea, albumin and cholesterol was seen in mange camels while an increase in glucose, total proteins, globulins, triglycerides was seen in mange infected camels. The biochemical values returned to within the normal range post therapy.

Therapeutic efficacy was assessed based on disappearance of mites from skin scrapings, apparent clinical recovery and also improvement among haemato-biochemical values. Therapeutic efficacy revealed both Himax ointment and Amitraz as highly effective, but Amitraz (12.5 %) solution is best in camels since the drug is economical compared to other two drugs.

Sub Project II : Epizootiology of gastro-intestinal helminthic infection in camels

The epizootiological studies revealed significant variation of incidence in relation to age, sex and breed Fig. 2.6.1. The intensity of infection was assessed based on eggs per gram of faeces (e.p.g). The percent incidence of faecal e.p.g count was 56.32%, 31.03%, and 12.64% for up to 100, 100-1000 and > 1000 e.p.g respectively. The commonly noticed helminthic infection in camels is strongylosis infection.

Table 2.6.1. Percent incidence of mange in camels with relation to sex, age and breed (1991-1997)

Year	Sex		Age (Years)*			Breeds				Overall* % incidence
	Male	Female	0-1	1-3	> 3	B	J	K	C	
1991	6.45	4.79	3.12	22.03	0.00	5.60	4.68	7.01	0.00	5.38
1992	16.27	7.00	0.00	3.33	16.19	16.19	3.03	8.62	7.14	10.28
1993	29.03	9.37	2.12	29.09	16.55	18.09	16.66	18.33	0.00	16.60
1994	4.39	17.68	11.90	3.12	14.63	16.16	6.84	15.38	7.14	12.60
1995	35.29	33.33	21.95	13.15	43.05	36.89	22.78	62.06	16.66	34.08
1996	38.37	30.82	60.34	19.23	25.67	29.52	31.70	46.66	46.66	33.62
1997	62.79	18.49	31.03	11.53	40.54	35.23	32.92	33.33	46.66	34.91
Overall	27.09	16.77	21.63	15.20	21.76	22.08	17.95	22.15	18.00	

*(P<0.05) Significant at 5% level

B: Bikaneri; J: Jaisalmeri

(P>0.05) Non-significant at 5% level

K: Kachchhi; C: Crossbred

Table 2.6.2. Mean haematological parameters in mange camels before and after therapy.

Parameters	Group I		Group II		Group III		Group IV	
	B.T.	A.T.	B.T.	A.T.	B.T.	A.T.	B.T.	A.T.
Hb (gm/dl)	13.125	11.575*	9.750	12.825*	12.250	15.000*	12.950	11.300*
ESR (mm/hr)	1.75	2.00	1.25	1.50	1.00	1.75*	1.25	1.00
TLC (/C.mm.)	8237.5	7612.5	7987.5	7275.0*	9490.0	8737.5	7750.0	7850.0
DLC (%)								
Neutrophils	44.00	46.50	44.50	50.50*	47.25	47.00	47.25	42.75*
Eosinophils	9.25	9.75	7.00	4.75	9.00	5.75*	7.00	11.00*
Baso phils	1.00	0.75	0.75	0.75	0.75	0.50	1.00	0.75
Lymphocytes	39.50	37.00	40.25	39.25	35.50	41.00*	39.25	39.25
Monocytes	6.25	6.00	7.50	4.75*	7.50	5.75*	5.50	6.25

* indicates significance at 5% level.

B.T: Before therapy ; A.T.: After therapy.

Sub Project III : Role of camel milk as an adjuvant nutritional supplement in patients of pulmonary tuberculosis

P.I. : Gorakh Mal
 Associates : Dr. V.K.Jain *
 Dr. D.Suchitra Sena,
 Dr. M.S. Sahani

A preliminary study was carried out in collaboration with Deptt. of T.B. & chest diseases (S.P. Medical College, Bikaner) to study the therapeutic efficacy of camel milk on T.B. patients.

* Prof. & Head, Govt TB Hospital, Bikaner.

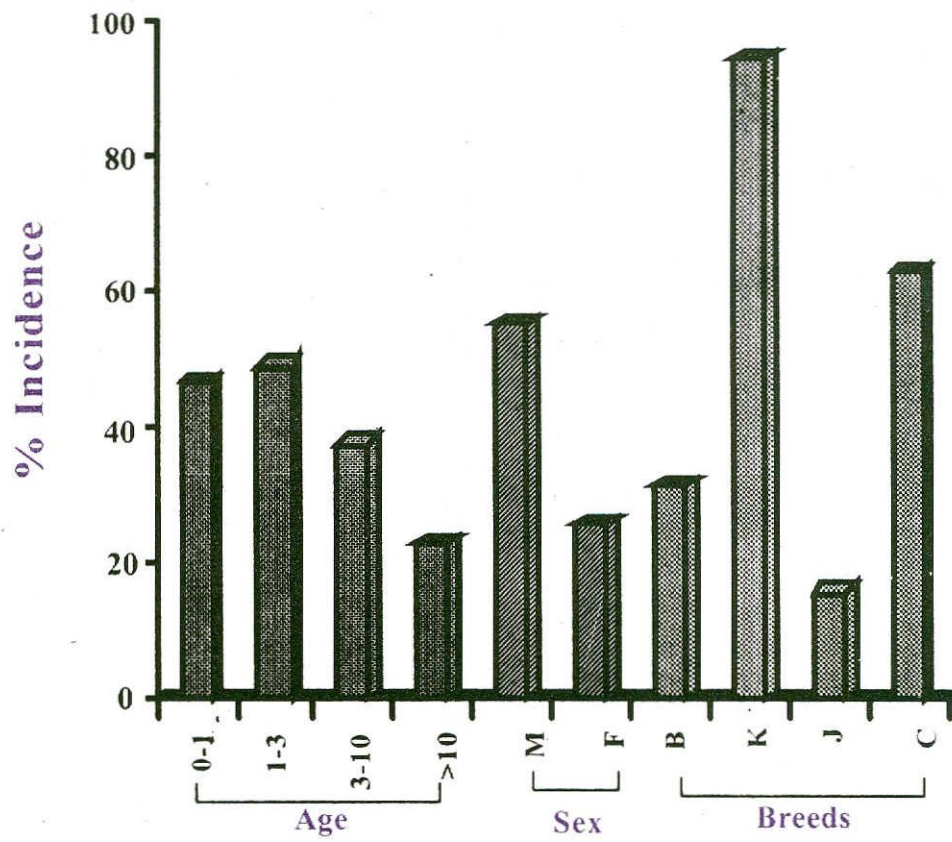
Table 2.6.3. Mean biochemical parameters in mangle camels before and after therapy

Parameters	Group I		Group II		Group III		Group IV	
	B.T.	A.T.	B.T.	A.T.	B.T.	A.T.	B.T.	A.T.
ALT (IU/L)	8.999	7.102	11.763	6.677	13.996*	6.640*	9.090	8.506
AST (IU/L)	78.967*	52.331*	88.167*	49.659*	76.467**	38.204**	68.318	75.250
ALP (IU/L)	98.635	113.173	89.899	144.953	74.826	111.710	91.238	126.497
Urea (IU/L)	21.053	20.099	21.380	28.634	17.935	29.193	27.027	27.119
Glucose (mg/dl)	101.459	88.302	109.461	87.028	119.352	94.653	97.801	107.965
Proteins (g/dl)	5.509**	4.780**	5.519*	4.545**	6.465**	5.113*	4.849**	5.875**
Globulins (g/dl)	2.441	2.537	2.691*	2.288*	3.141**	2.129*	2.859	3.016**
Albumins (g/dl)	3.069	2.908	2.257*	2.828*	2.983	3.324**	2.990	2.859
Triglycerides (mg/dl)	8.695	8.537	8.306**	7.277**	14.061	8.062	8.904	13.964
Cholesterol (mg/dl)	28.005	32.754	23.401	31.732	25.447**	31.952	22.309	24.581

* indicates significance at 5% level

** indicates significance at 1% level

Fig 2.6.1 Percent incidence of GI nematodal infections in camels



M : Male B : Bikaneri J : Jaisalmeri
F : Female K : Kachchhi C : Crossbred

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The patients were grouped as empyema (G-1) and fresh pulmonary T.B. (G-2) having a control group in each. The patients were given standard therapy alongwith raw milk @ 1kg/day as supplement. The clinical symptoms, bacteriological, radiological, haematological and biochemical parameters were recorded at monthly intervals and were presented in Table 2.6.4, 2.6.5 and 2.6.6. However body weights were recorded fortnightly. At the end of the trial; increase in appetite, no pus formation, more radiological improvement in terms of lungs expansion was found in patients supplemented with camel milk in G-1. Haematological parameters showed significant ($P<0.01$) higher Hb content; significantly ($P<0.05$) reduction in neutrophils in camel milk supplemented group of empyema T.B. patients. The activity of LDH was significantly ($P<0.05$) lower in patients fed with camel milk in G-1, while Zn was significantly ($P<0.01$) higher. Increase in body wt. was also seen. Increase in appetite, reduction in radiological reflections, significantly ($P<0.05$) higher Hb content, reduction in ESR and TLC ($P<0.05$) was noticed in the patients supplemented with camel milk in fresh pulmonary T.B. (G-2). Significantly ($P<0.01$) higher Zn and significant ($P<0.05$) increase in body weights were found in the patients supplemented with camel milk. The trial concludes that camel milk can act as an adjuvant nutritional supplement in faster recovery of T.B. patients.

Table 2.6.4. Clinical and bacteriological findings

Parameters		Group I		Group II	
		0 day	After 3 month	0 day	After 3 month
Cough	T ₀	++ve (4)	-ve (4)	++ve (3)	-ve (3)
	T ₁	++ve (7)	-ve (4)	++ve (4)	-ve (4)
Expectoration	T ₀	-ve (4)	-ve (4)	++ve (3)	-ve (3)
	T ₁	-ve (7)	-ve (4)	++ve (4)	-ve (4)
Breathlessness	T ₀	++ve (4)	-ve (4)	-ve (3)	-ve (3)
	T ₁	-ve (7)	-ve (4)	+ve (4)	-ve (4)
Haemoptysis	T ₀	+ve (4)	-ve (4)	+ve (3)	-ve (3)
	T ₁	+ve (7)	-ve (4)	+ve (4)	-ve (4)
Pain chest	T ₀	+ve (4)	+ve (4)	-ve (3)	-ve (3)
	T ₁	+ve (7)	-ve (4)	+ve (4)	-ve (4)
Fever	T ₀	-ve (4)	-ve (4)	-ve (3)	-ve (3)
	T ₁	-ve (7)	-ve (4)	+ve (4)	-ve (4)
Appetite	T ₀	Fair (4)	Same (4)	Fair (3)	Same (3)
	T ₁	Fair (7)	Increased (4)	Decreased (4)	Increased (4)
Bacteriological					
Status of AFB	T ₀	-ve (4)	-ve (4)	+ve (3)	-ve (3)
	T ₁	-ve (7)	-ve (4)	+ve (4)	-ve (4)
Pus(ml/day)	T ₀	117.50A±19.58 (4)	45.00B±3.53 (4)	-	-
		183.33± 10.91 (7)	-	-	-

T₀ - Control group

T₁ - Camel milk supplemented group

A,B-P<0.01

Figures in the parentheses indicate the number of patients

AFB : Acid Fast Bacilli

Group I :- Empyema T.B.

Group II :- Fresh Pulmonary T.B.

Table 2.6.5. Haematological parameters

Parameters		Group I		Group II	
		0 Day	After 3 Month	0 day	After 3 month
Hb (g/dl)	T ₀	10.87±0.20(4)	12.11±1.76(4)	10.51±0.99(3)	13.05±1.06(3)
	T ₁	11.22 ^a ±0.12(7)	14.41 ^b ±1.24(4)	11.12 ^a ±0.24(4)	13.13 ^b ±0.70(4)
ESR/(mm hr.)	T ₀	113.25±5.68(4)	84.00±39.40(4)	82.50±30.63(3)	36.03±10.14(3)
	T ₁	80.00±18.90(7)	29.00±12.02(4)	88.00 ^a ±22.81(4)	20.05 ^b ±8.89(4)
TLC/(Cmm)	T ₀	8337.50±737.38	5450.00 ^b ±686.3	9800.51±1140.6	6800.30±763.37
	T ₁	(4)	9(4)	5(3)	(3)
		12036.00±2703.9	6350.00 ^b ±353.5	12775.10 ^a ±3038.19	5916.66 ^b ±112.7
	6(7)	5(4)	(4)	3(4)	
Differential Leucocyte Count (%)					
Neutrophils	T ₀	60.00±5.48(4)	53.52±3.18(4)	60.00±6.15(3)	61.00 ^c ±3.15(3)
	T ₁	60.50±3.19(7)	45.01 ^b ±4.36(4)	59.00±7.13(4)	51.00 ^d ±2.18(4)
Eosinophils	T ₀	6.75±1.80(4)	7.53±3.75(4)	6.00±2.40(3)	5.00±1.70(3)
	T ₁	4.67±0.87(7)	6.01±1.78(4)	15.33±7.63(4)	8.00±0.50(4)
Lymphocytes	T ₀	25.25±3.50(4)	30.59±3.18(4)	32.00±4.63(3)	28.00±2.71(3)
	T ₁	26.33 ^a ±4.82(7)	38.75 ^a ±0.63(4)	22.66±5.50(4)	33.34±2.50(4)
Monocytes	T ₀	8.00±1.75(4)	7.51±1.41(4)	2.00±0.60(3)	6.00 ^b ±1.22(3)
	T ₁	8.50±1.33(7)	8.03±1.47(4)	3.00±0.50(4)	7.66 ^b ±1.52(4)

T₀ - Control group

T₁ - Camel milk supplemented group

A,B & C,D- P<0.01

a,b & c,d- P<0.05

Figures in the parentheses indicate the number of observations

Group I :- Emphyema T.B. Group II :- Fresh Pulmonary T.B.

Table 2.6.6. Biochemical parameters and body weight

Parameters		Group I		Group II	
		0 Day	After 3 Month	0 Day	After 3 month
SGOT (IU/L)	T ₀	42.84±16.38 (4)	25.32±5.26 (4)	40.26±15.26 (3)	3.38c±4.26 (3)
	T ₁	22.54±5.29 (7)	20.86±2.18 (4)	47.26±19.72 (4)	27.36d±2.57 (4)
SGPT (IU/L)	T ₀	16.03±4.23 (4)	17.12±8.56 (4)	19.24±6.19 (3)	13.66±4.89 (3)
	T ₁	19.98±3.20 (7)	10.44±3.66 (4)	21.42± 5.69 (4)	18.27±6.88 (4)
ALP (IU/L)	T ₀	119.41C±18.27 (4)	152.79±19.18 (4)	290.03AC±20.10 (3)	170.54B±8.16 (3)
	T ₁	248.81D±26.59 (7)	200.38±14.06 (4)	158.89D±17.72 (4)	192.08±13.84 (4)
LDH (IU/L)	T ₀	399.37±37.20 (4)	267.85±55.68 (4)	300.63±47.69 (3)	271.40±40.63 (3)
	T ₁	366.34a±34.64 (7)	245.85b±16.65 (4)	328.87±34.74 (4)	223.45±84.25 (4)
Protein (g/dl)	T ₀	6.36a±0.36 (4)	9.79b±1.25 (4)	5.51±1.23 (3)	6.95±0.58 (3)
	T ₁	5.57a±0.76 (7)	8.74b±1.21 (4)	5.69±1.65 (4)	7.21±0.32 (4)
Albumin (g/dl)	T ₀	3.06±0.52 (4)	4.83±0.76 (4)	2.05±0.64 (3)	3.61±0.56 (3)
	T ₁	3.02a±0.26 (7)	4.38b±0.54 (4)	3.61±0.56 (4)	4.12±0.34 (4)
Glucose (mg/dl)	T ₀	78.27±10.93 (4)	67.23±9.83 (4)	80.25a±9.16 (3)	120.88bc±5.63 (3)
	T ₁	77.78± 7.26 (7)	82.15±3.30 (4)	67.94±10.35 (4)	67.26d±16.36 (4)
Urea (mg/dl)	T ₀	17.20±3.21 (4)	28.93±11.46 (4)	20.84±4.64 (3)	28.27±5.69 (3)
	T ₁	31.38±7.62 (7)	30.70±3.90 (4)	26.58±6.96 (4)	33.15±8.02 (4)
Creatinine (mg/dl)	T ₀	0.43±0.16 (4)	0.84±0.15 (4)	0.14ac±0.06 (3)	0.88b±0.21 (3)
	T ₁	0.59±0.10 (7)	0.65±0.02 (4)	0.59d±0.14 (4)	0.64±0.02 (4)
Ca (mg/dl)	T ₀	9.10±1.18 (4)	11.09±2.06 (4)	6.13±2.29 (3)	9.16±1.79 (3)
	T ₁	9.17±1.35 (7)	8.37±2.36 (4)	10.01±2.11 (4)	7.66±2.64 (4)
P (mg/dl)	T ₀	7.09a±1.05 (4)	4.11b±0.53 (4)	3.20±1.09 (3)	4.08±0.29 (3)
	T ₁	5.00±0.79 (7)	3.96±0.55 (4)	5.89±1.53 (4)	4.35±0.27 (4)
Mg (meq/l)	T ₀	1.80±0.19 (4)	1.59±0.31 (4)	2.51±0.63 (3)	1.97±0.15 (3)
	T ₁	1.61±0.19 (7)	1.74±0.17 (4)	2.10±0.38 (4)	1.38±0.19 (4)
Zn (mg/dl)	T ₀	54.46±3.62 (4)	58.24C±1.32 (4)	55.00±2.44 (3)	60.10c±3.63 (3)
	T ₁	61.97A±1.43 (7)	74.60BD±2.81 (4)	57.25A±1.79 (4)	72.20Bd±2.26 (4)
Body Wt. (Kg)	T ₀	37.00c±2.12 (4)	33.00C±1.58 (4)	45.01±2.30 (3)	47.00± 1.56 (3)
	T ₁	42.73d±1.09 (7)	45.50D±2.52 (4)	41.75a±2.29 (4)	48.00b± 0.71 (4)

T₀ - Control group

T₁ - Camel milk supplemented group

A,B & C,D- P<0.01

a,b & c,d- P<0.05

Figures in the parentheses indicate the number of observations

Group I :- Emphyema T.B. Group II :- Fresh Pulmonary T.B.

2.7. SCHEMES

Research scheme	:	Network collaborative programme on crop based animal production system
P.I.	:	M.S. Sahani
Project Incharge	:	A.K. Nagpal
Investigator Associates	:	Mrs. N. Saini Ram Kumar Raja Purohit Baldev Kiradoo

Sub Project I : Comparative performance of camel calves kept in Gramma pasture and range land grazing management system

This experiment was initiated in August, 1998 to study the impact of camel calves grazing on vegetation, soil fertility and also to evolve an appropriate system for maximum sustainability. In the beginning of 1998, a 4.5 hectare land was transplanted with Gramma grass which was used in the current study. The average fresh yield of Gramma (*Panicum antidotale*) was 16000 kg/hectare and dry yield was 3200 kg/hectare as on 21.07.98. Assuming dry matter intake of 2.0% of body weight, the carrying capacity of Gramma pasture at stocking rate of 5 camel calves was found to be enough for 128 days. Thus 22 camel calves (age 1.5 years, body weight 250 kg) were sent for 7 grazing in 4.5 hectares (group I). The group II camel calves were allowed grazing in the adjoining 17 hectares range land (Area 1). This experiment continued for 74 days from August to October, 98. The camel calves of group I gained live weights in the month of August, 98 followed by sharp decline of body weights in the next 25 days period due to poor pasture growth and quality. The pasture completely dried up, hence the camel calves were shifted to stall feeding of Guar (*Cyamopsis tetragonoloba*) phalgati. The daily supplementation of guar phalgati was 7.2 kg/d and the calves gained in their body weights over the initial body weights (Table 2.7.1). Group II calves grazing in 17 hectares area (area 1) also gained live weights in the first month followed by sharp body weight loss and regain of their initial weights when shifted to another fenced range land area of 11 hectares (Area 2).

The soil fertility status of two grazing areas at the beginning of the experiment was almost similar (Table 2.7.2).

Botanical composition of range land area 1 and 2 are presented in Fig. 2.7.1 and 2.7.2. The edible plants comprised 18.30% in area No. 1 and 20.74% in area No. 2. The ground cover had mainly boor (*Andropogon lamiges*) grass.

Fig. 2.7.1. Area wise botanical composition of range land

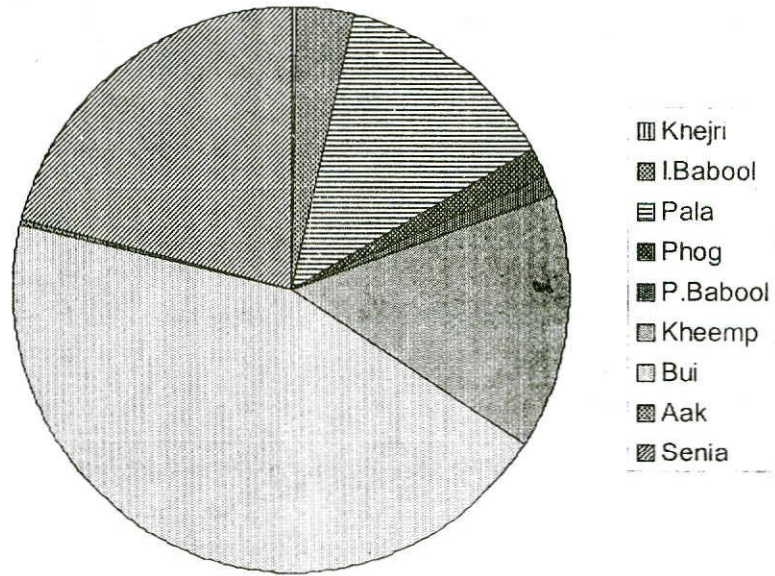


Fig. 2.7.2. Area wise botanical composition of range land

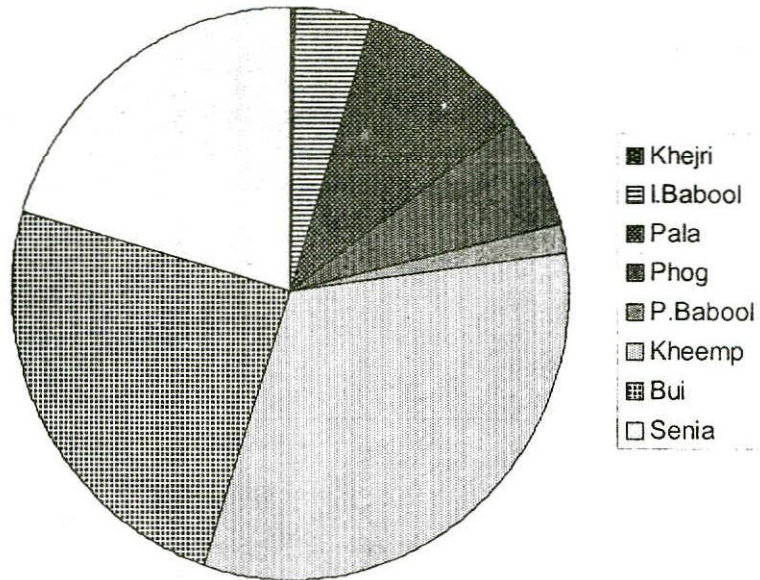


Table 2.7.1. Average body weights (kg) variations in the two groups of camel calves kept in Gramma pasture and rangeland area

Parameters (n)®	Gramma Pasture (Group I)	Rangeland (Group II)
	21	20
Area (ha)	4.5	17
Dates		
01.08.1998	244.45±10.22	250.00±10.22
01.09.1998	257.55±9.45	262.10±10.86
26.09.1998	239.40±9.96	229.14±9.41
	Stall feeding	Grazing
	@ 7.0 kg/d Guar Phalgati	in Area No.2 (11 ha)
13.10.1998	256.70±10.11	249.10±10.07
Body weight changes kg over 74 days	12.35±0.97	-0.71±1.41
Average daily change* (g/d)	166.88±13.16	-9.66±19.05

*P<0.01

n : Number of animals

Table 2.7.2. Soil fertility status of Gramma pasture and rangeland

Parameters (n)®	Gramma pasture	Rangeland (Area 1)	Normal range
	5	5	
pH	8.68±0.04	8.38±0.02	7.0-8.5
EC (mmhos/cm)	0.19±0.02	0.15±0.01	> 10
Carbon (%)	0.11±0.01	0.11±0.01	0.5-0.75
Available phosphate (kg/ha)	8.80±1.50	9.60±2.04	22.0-56.0
Available potash (kg/ha)	314.00±14.35	388.00±40.67	141.0-340.0

II. Utilization of Sewan (*Lasiurus indicus*) grass alone and in combination with Ardu (*Ailanthus excelsa*) leaves in camel calves

This experiment on 5 camel calves was initiated in the last week of January, 99 with a view to tide over the natural calamity as being experienced in this programme.

Five young Bikaneri camels (age 2 years, 297.2±8.60 kg) were given dry chaffed sewan grass ad-lib in phase I for one month in Jan-Feb. 99 followed by supplementation of dry Ardu leaves @ 1.0 kg/head/d in phase II for one month in Feb-March, 99. Average DMI (dry matter intake) in phase I was 2.19±0.22 kg/d or 0.78±0.08 kg/100 kg body weight which increased (P<0.01) to 3.36±0.12 kg/d or 1.18 kg/100 kg body weight in phase II (Table 2.7.3). Supplementation was also found to improve (P<0.01) digestibility coefficients of all proximate principles in phase II. Higher DMI coupled with higher digestibility of proximate components resulted in higher DCP and ME intake in camel calves in phase II. Average daily water intake was also higher in phase II (7.83±0.58 l/d) than in phase I (6.47±0.89 l/d) on account of higher DMI. No significant difference was observed between 2 phases in respect of serum glucose, total protein, albumin, urea, cholesterol, triglycerides, sodium, potassium, chloride, calcium and phosphorous indicating the efficient homeostatic mechanism of camels (Table 2.7.4). The results indicated the positive benefit of tree leaves supplementation on nutrient utilization and growth in young camels given only sewan grass diet.

Table 2.7.3. Dry matter intake, nutrient digestibility of young camels calves given Sewan alone and in combination with Ardu leaves

Parameters (n)	Phase I 5	Phase II 4
Dry matter and water intake		
Sewan (kg/d)	2.19±0.22	2.68±0.18
Ardu (kg/d)		0.68±0.08
Total DMI (kg/d)	2.19±0.22	3.36±0.12
DMI (kg/100 kg body weight)*	0.78±0.08	1.18±0.08
DMI (g/kg W0.75)*	31.90±3.08	48.45±2.76
Nutrient digestibility		
DM*	-9.52±15.64	45.34±1.67
OM	40.73±9.28	52.74±1.47
CP*	-6.39±15.03	55.86±2.11
EE	-5.00±15.97	28.51±4.87
CF	46.47±10.65	55.13±2.79
NFE	44.93±7.05	51.73±1.81

Parameters (n)	Phase I 5	Phase II 4
Nutrient intake		
DCP (g/d)	-2.00±20.07	188.50±12.07
TDN (kg/d)	0.89±0.23	1.75±0.07
ME (MJ/d)	13.18±3.47	26.06±0.97
DCP (g/kg W ^{0.75})*	-0.05±0.29	2.72±0.22
TDN (kg/kg W ^{0.75})*	12.76±3.23	25.12±1.19
ME (MJ/kg W ^{0.75})*	0.19±0.05	0.38±0.02
Water intake (l/d)	6.47±0.89	7.83±0.58
Water intake (ml/kg W ^{0.82})	62.83±2.70	76.42±7.57

n : Number of animals

*P<0.01

Table 2.7.4. Serum bio-chemical profile of camel calves

Parameters (n)	Phase I 5	Phase II 5
Serum bio-chemicals		
Glucose (mg/dl)	105.27±5.17	102.10±5.69
Total protein (g/dl)	6.36±0.05	6.06±0.15
Albumin (g/dl)	3.71±0.05	3.66±0.06
Urea (mg/dl)	17.88±1.79	14.50±0.82
Cholesterol (mg/dl)	15.03±4.33	23.26±2.36
Triglycerides (mg/dl)	36.41±1.17	25.32±5.13
Sodium (meq/L)	155.40±1.83	160.00±1.26
Potassium (meq/L)	5.24±0.07	5.34±0.13
Chloride (mmol/l)	100.94±1.25	102.29±1.78
Calcium (mg/dl)	8.00±0.09	8.64±0.39
Phosphorus (mg/dl)	5.11±0.18	4.42±0.18

n : Number of animals

2.7.2. Research scheme: Evaluation & Conservation of double humped camels (*Camelus bactrianus*) in cold desert region

Principal Investigator : Dr. M.S. Sahani
Associates : Dr. B.P. Mishra
 Dr. Raghvendar Singh
 : Shri Banamali Yadav

Construction of camel sheds, mangers, barbed wire fencing etc. have been completed at FRL-DET, Partapur, Ladakh. Basic information regarding the distribution, behaviour, breeding and management practices etc. were collected. The total camel population of the area is about 90 which is distributed in the Nobra valley. Blood samples were collected from both sexes and sera samples separated and brought to NRCC for biochemical analysis. Haematology (Table 2.7.2.1) and blood biochemical attributes viz. blood serum LDH, GPT, GOT, TG, total protein, urea, albumin, Ca, P, K, Mg and Na of bactrian camel and comparison with dromedary camel are presented in Table 2.7.2.2 which revealed more or less similar values except serum urea which showed significant difference ($P < 0.05$) between the single humped (23.31 ± 1.44) and double humped (32.38 ± 2.0) camels. This difference may be due to the dietary intake of nitrogen. Hair samples from various sites of young calf and adult camels were analysed and compared with that of single humped camel (Table 2.7.2.3). The mean staple length was found to be higher at the hump region (13.61cm) followed by neck (7.57cm) and the mid side (6.48cm). The high staple length (15.45cm) and quality of wool fiber indicate its usefulness in the cold arid region. The higher percentage of non-modulated (64.9%) fibers in adult camel indicated its usefulness in fiber processing. The comparison of fiber attributes with that of dromedary camel calves (Table 2.7.2.3) indicated that staple length and percentage of non-medulated fibers at all the 3 sites were higher in bactrian camels.

Biometrical data on double humped camel was recorded at various places of Nobra valley namely; Skampuk, Partapur and Diskit. Overall 11 animals were used to collect biometrical data covering 12 parameters. Least square means of various biometrical parameters are presented in Table 2.7.2.4. The bactrian camel was observed to be short in height, compact and well built. Least square analysis indicated significant effect of sex on body length ($P < 0.01$), leg length ($P < 0.01$), distance between humps ($P < 0.01$), height at wither ($P < 0.05$) and distance between ears ($P < 0.05$). Comparison with single humped dromedary camel showed that bactrian camel is short in height while body length and heart girth are more or less similar.

Table 2.7.2.1. Haematological parameters of dromedary and bactrian camels

Parameters	Single humped	Double humped
RBC (X10 ¹² litre)	8.39±0.40	8.58±0.46
WBC (X10 ⁹ litre)	13.36±0.52	13.68±0.39
Hb (g/dl)	11.10±1.39	11.67±1.26
DLC (%)		
Neutrophils	51.33±0.88	53.33±0.89
Eosinophils	4.50±0.43	5.00±0.36
Basophils	1.00±0.26	0.33±0.21
Lymphocytes	37.33±0.99	35.17±0.79
Monocytes	5.84±0.48	6.17±0.31

Mean ± SE of 6 observations; RBC, Red blood cell; WBC, White blood cell; DLC Differential leukocytes counts.

Table 2.7.2.2. Serum biochemicals of single and double humped camels

Parameters	Single humped	Double humped
LDH (IU/l)	667.00±54.34	599.00±43.17
SGOT (IU/l)	69.99±5.12	77.33±7.52
SGPT (IU/l)	12.22±0.68	24.81±7.09
TG (mg/dl)	15.22±1.92	13.79±3.78
Urea* (mg/dl)	23.31±1.44	32.38±2.00
TP (g/dl)	6.44±0.19	7.13±0.20
Albumin (g/dl)	3.63±2.45	4.03±0.15
Ca (mg/dl)	11.33±0.71	10.17±0.62
P (mg/dl)	9.09±0.56	9.56±1.18
Mg (meq/l)	2.34±1.12	2.62±1.05
K (meq/l)	7.30±0.50	7.18±0.63
Na (meq)	132.00±2.45	131.00±5.31

* P < 0.05

Table 2.7.2.3. Comparison of wool fibre characteristics between dromedary and bactrian camels

Sites/ Parameters	Mid side			Hump		Neck	
	Dromedary	Bactrian adult	Bactrian* calf	Dromedary	Bactrian Adult	Dromedary	Bactrian Adult
Staple length (cm)	4.24±0.21 (18)	6.48±0.43 (4)	15.45±0.7 5	12.03±0.71 (18)	13.62±1.86 (5)	2.99±0.18 (17)	7.57±1.47 (5)
Mean fibre Dia. (m)	22.76±0.54 (18)	24.47±4.3 3 (4)	18.16±0.4 3	27.16±0.64 (18)	34.81±5.4 0 (5)	23.27±0.60 (17)	35.05±4.9 0 (5)
PERCENTAGE OF FIBRE TYPES							
Pure (%)	41.89±1.57 (18)	64.99±8.8 6 (4)	83.39	42.29±1.32 (18)	57.19±4.7 9 (5)	48.08±1.7 6 (17)	59.56±4.2 3 (5)
Hetero (%)	32.99±1.88 (18) (4)	23.46±4.2 8	14.95	35.70±1.11 (18)	30.18±4.3 2 (5)	32.55±1.3 8 (17)	32.36±4.5 4 (5)
Hairy (%)	20.62±1.22 (18)	11.55±5.6 4 (4)	1.66	18.46±1.27 (18)	12.63±0.9 9 (5)	16.35±1.17 (17)	8.08±1.64 (5)
Kemp (%)	3.46±0.42 (13)	-	-	4.48±0.60 (13)	-	3.88±0.55 (13)	-

Note : Figures in the Parentheses indicate the number of animals studied. Mean fibre diameter was calculated by taking 300 observations

* One Bactrian camel calf

Table 2.7.2.4 : Least square means of certain biometrical parameters (in cm) of double humped camel (*Camelus bactrianus*)

Parameter	Male	Female	Overall
Body length	174.00 + 3.47 (3)	149.37+2.12 (8)	161.68+2.0 (11)
Height at Wither	170.70+3.94 (3)	153.20+2.27 (8)	161.95+1.97* (11)
Heart girth	201.66+6.95 (3)	191.62+4.25 (8)	196.64+4.07 (11)
Neck length	93.90+5.27 (3)	87.90+3.04 (8)	90.90+2.63 (11)
Face length	61.90+2.90 (3)	54.90+1.67 (8)	58.40+1.45 (11)
Leg length	143.90+2.20 (3)	115.40+1.27 (8)	129.65+1.10** (11)
Distance between eyes	28.5+1.09 (3)	27.00+0.63 (8)	27.75+0.54 (11)
Distance between ears	27.60+1.14 (3)	23.60+0.66 (8)	25.60+0.57* (11)
Ear length	11.90+0.34 (3)	11.40+0.20 (8)	11.65+0.17 (11)
Muzzle diameter	47.20+1.46 (3)	43.70+0.78 (8)	45.45+0.68 (11)
Distance between humps	24.80+1.46 (3)	15.30+0.84 (8)	20.05+0.73** (11)

*-significant - (P<0.05), **- significant -(P<0.01)

Figure in parentheses indicate number of animals

Genomic DNA isolation and PCR-RAPD analysis

Blood samples from 5 bactrian camels of both sexes were collected at Ladakh and transferred to NRCC. Genomic DNA was isolated successfully following a quick modified procedure reported earlier for dromedary camel. Spectrophotometric analysis and gel electrophoresis revealed good quality intact genomic DNA isolated from peripheral blood leukocytes (Figure 2.7.2.1).

Polymerase Chain Reaction (PCR) based Random Amplification of Polymorphic DNA (RAPD) technique was employed to study the genetic variability between the two species of camels viz. *Camelus dromedarius* & *Camelus bactrianus* (Fig. 2.7.2.2). Random oligo primers were tried to evaluate the genetic polymorphism. Preliminary results indicated genetic polymorphism among the two species of camels. The genetic variation was more between the two species in comparison to within species variation. The application of this technique may be useful in the genetic characterization of the two species of camel.

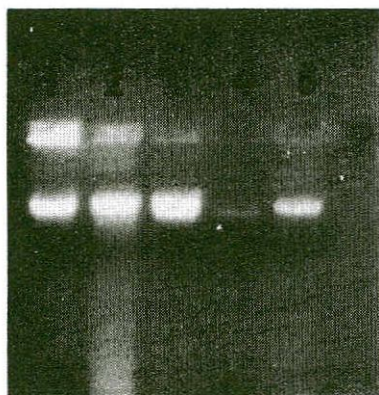


Figure 2.7.2.1: Agarose gel electrophoregram showing double humped (*Camelus bactrianus*) camel genomic DNA isolated from blood leukocytes

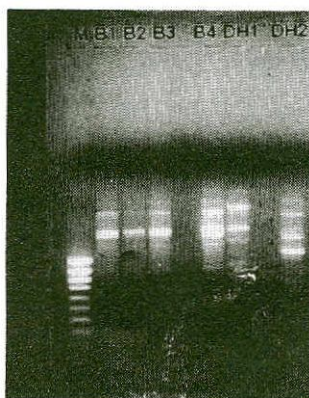


Figure 2.7.2.2 : PCR-RAPD pattern of bactrian and dromedary DNA, B-Bikaneri camel ; D-Double humped camel

2.8. Other Research trials

Title	:	Studies on physical and chemical properties of camel milk
Principal Investigator	:	Miss Poonam Jayant
Associate	:	Raghvendar Singh M.S. Sahani

Milk samples from 3 Bikaneri camels were analysed for acquiring base line data on post partum changes in camel milk from day 1 to day 7.

The colostrum was creamish white in colour. The moisture content was lowest immediately after parturition and then fluctuated from 81.7% to 86.6%. Total solids, Ash, lactose and protein values were highest on the first day and ranged from 13.56% to 18.26%, 0.63% to 0.78%, 5.49% to 6.11% and 5.97% to 6.70% respectively. Upto 7th day post partum, protein and lactose content were high (6.46% and 5.70% respectively) as compared to normal milk (3.95% and 4.88% respectively). The fat per cent in the colostrum was 2.89%. It is therefore concluded that the transition of colostrum to normal milk is not complete by 7 days post partum.

2.9. INTER-INSTITUTIONAL COLLABORATIONS

2.9.1. Hormonal and renal regulation of fluid retention in dromedary camel

(Ph.D. Research project of Dr. Nalini Kataria, Vety. Physiology, CCSHAU, Hisar, Major Advisor : Dr. V.K. Agarwal, CCSHAU, Hisar, Co-advisor : Dr. Raghvendar Singh, NRCC, Bikaner).

Eight adult female camels were used for the study. The study in winter season was grouped into control, dehydration (24 days) and rehydration phases. A loss of 33% body weight was observed during the course of dehydration. The haemoglobin content, packed cell volume and specific gravity were 18g/dl, 44% and 1.070 respectively. The mean value of total serum proteins, glucose, urea, creatinine and serum electrolytes increased up to 16th day of dehydration. In intravenous glucose tolerance test the blood glucose levels increased from 129.21 to 441.09 mg/dl. In clearance test it was observed that phenol sulphonaphthalein started coming out in urine at 7-10 minutes. The normal urine pH was in alkaline range and alkalinity increased during the course of dehydration. Further analysis of results are in progress.

2.9.2. Studies on the physio-chemical and immunological properties of camel lactoferrin

Research worker : Raghvendra Singh

Sumit Arora *

Camel lactoferrin was isolated and purified from acid whey using cation exchange chromatography on Cm-sephadex C-50 and gel filtration on Sephadex G-200 using Tris-HCl buffer pH 8.2. SDS-Gel electrophoresis gave a molecular mass of 78 KDa. The absorption spectrum gave λ max at 278 which was observed by lowering the pH to 2.0. The protein had an iron to the extent of 0.16% from which a molecular weight of 70 KDa was obtained taking two atoms of Fe^{+++} per mole of protein.

The lactoferrin concentration in camel milk ranged from 0.95-2.5 mg/ml in Bikaneri breed. Antibodies against camel lactoferrin was raised in two rabbits. The immunodiffusion profile of camel milk revealed that camel milk lactoferrin had no antigenic relationship with bovine milk lactoferrin.

Bacteriological analysis showed that camel lactoferrin is inhibitory to *E.coli* micro-organism like other mammal lactoferrins. Camel lactoferrin showed bacteriostatic effect against *S.aureus*. The inhibitory action was at a concentration of 12 mg/dl of camel lactoferrin.

Two peptic fragments of molecular weight of less than 40 KDa were observed in camel and caprine lactoferrin. A minor band of undigested lactoferrin was also observed. Three major bands and a minor band of undigested lactoferrin were observed under tryptic action. Only one major band was observed under proteinase K action. Iso-electric point of camel lactoferrin was determined on PAGE using pH 3.5-10 ampholine. Camel lactoferrin resolved into two distinct bands in broad pI range i.e. 4.7 and 6.2 suggesting heterogeneity of the camel lactoferrin molecule. The sialic acid content was found out to be 0.55% and hexose content was 4.85%.

2.9.3. Characterization of midgut antigens of *Hyalomma anatolicum anatolicum* tick and their immunoprophylactic efficacy in rabbits and cattle

Author : Rajender Kumar

Major Advisor : D.P. Banerjee **

A significant reduction in per cent engorgement and per cent moulting of *Hyalomma anatolicum anatolicum* larvae was observed when fed on rabbits immunized with the gut supernate antigen (GS Ag). A significant increase in the engorgement and pre-oviposition periods and significant decrease in engorgement weight, oviposition period, egg mass weight and reproductive index was observed in adult female ticks when fed on rabbits and crossbred calves (*Bos indicus* x *Bos taurus*) immunized with GS Ag and fractionated gut supernate (GS-F) antigen, respectively.

* Scientist, Dairy chemistry, NDRI, Karnal.

** Professor, Dept. of Vety. Parasitology, CCSHAU, Hisar.

Maximum protection in rabbits against *H.a. anatolicum* was induced with GS Ag. The GS and GS-F Ags also induced significant cross-protection against *H.dromedarii* ticks in rabbits and calves, respectively in terms of significant decrease in per cent larval engorgement and significant alteration of feeding and reproductive performances of female ticks when fed on immunized rabbits and calves.

The antibody titre in the sera of immunized rabbits and calves started to increase from 7 day post-immunization (d.p.i.). Maximum titre i.e. 1:51200 was observed in response to GS Ag. The intradermal test revealed both immediate as well as delayed hypersensitivity reactions in the immunized rabbits and calves. A moderate to heavy mononuclear cell infiltration was observed in the dermis area in skin biopsies taken from the midgut antigens inoculated sites. The immunized calves showed significant level of stimulation index (>2) in lymphocyte stimulation test from day 14 to 84 post-immunization.

The SDS-PAGE profile of GS Ag revealed 26 polypeptides on 12% resolving gel, mol. wts. ranging between 25-208 KDa. The polypeptides of 185.85, 143.94, 109.92, 96.97, 47.19, 45.05 and 25.20 KDa mol. wts. appeared as the major proteins. On immunoblotting, eight immunogenic polypeptides of mol. wts. 185.85, 143.94, 122.34, 108.92, 96.97, 84.36, 68.44 and 51.79 KDa were detected.

Histopathological study of midguts revealed degenerative changes and sloughing of digestive cells. Transmission electron microscopy study showed no coated pit formation in digestive cells and scanning electron microscopy showed distortion in the shape of digestive cells of *H.a. anatolicum* ticks when fed on rabbits immunized with GS Ag.

2.9.4. Studies on camel lactoferrin between AIIMS, New Delhi and NRCC, Bikaner

Research Worker : Raghvendra Singh
: T.P. Singh *

In order to understand the mechanism of lactoferrin functions, its role in various secretions and the basis of species dependent variations in the structure and functions, it is necessary to determine the sequence and the three-dimensional structure of camel lactoferrin. The purified lactoferrin was used at concentrations 50-90 mg/ml. Ethanol was used at concentration 15-20% as precipitating agent in microdialysis method. At the lower range of protein concentrations in 25mM Tris-HCl, pH 8.2, a viscous layer separates in the mother liquor in which the lactoferrin appeared to be concentrated. The separation of layers in microdialysis method was often a prerequisite for obtaining the lactoferrin crystal using ethanol as precipitating agent. Further, fine tuning was done for the concentration of lactoferrin and ethanol to obtain large crystals suitable for the diffraction studies.

The mammary gland tissue of camel was obtained from NRCC, Bikaner. The tissue was

* Professor, All India Institute of Medical Sciences, New Delhi.

immediately kept in GITC buffer, minced and kept in ice. The tissue was homogenized in the same buffer and from the clear supernatant the total RNA was isolated using hot-phenol method. Since the yield of total RNA was very low (about 50 µg) the isolation of polyA⁺mRNA was not attempted. The total cDNA was synthesized from the total RNA using MMLV-reverse transcriptase using oligo dT primers in the presence of Rnase inhibitor. Using tris cDNA, a fragment of 293 bp was PCR-amplified using primers of conserved region of lactoferrin gene and cloned in pGEM-T vector. The 293 bp consists of 144 bp of ORF, stop codon and 146 bp of 3'UTR. This clone was sequenced. This sequence corresponds to the 48 aminoacids at the C-terminal end of lactoferrin.

2.10. CAMEL HEALTH MANAGEMENT

Clinical cases :

During the period 176 clinical cases were treated. Among the different cases, 19 were of digestive disorders, 58 of surgical affections and other including skin affections were 99. Age, sex and breed wise morbidity are presented in Table 2.10.1.

Prophylactic measures :

1. Control of Trypanosomiasis

For prevention and control of trypanosomiasis quinapyramin methyl sulphate and chloride were injected twice in a year in the months of August - September and in February-March. No case of trypanosomiasis was detected.

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-April and in the month of September-October.

3. Control of internal parasites

The camels were given broad spectrum anthelmintics twice in a year in the month of September-October and March-April.

Mortality :

The specific death rate (SDR %) was 6.08 during the year 1998-99. The breed wise mortality per cent in Bikaneri, Kachchi, Jaisalmeri and cross bred (Arab x Bikaneri) was 5.86, 7.69, 2.77 and nil respectively. Age, sex and breed wise mortality per thousand camel days per day are presented in Table 2.10.2 and 2.10.3.

Table 2.10.1. Age, sex and breed wise morbidity 1998-99

S. Name of N. disease/ diagnosis	Sex		Breed				Age group			Total
	M	F	B	J	K	AXB yr	0-1 yrs	1-3 yrs	>3	
1. Digestive system										
• Simple indigestion /dyspepsia	3	3	3	3	-	-	-	-	6	6
• Gastroenteritis	1	-	-	1	-	-	-	-	1	1
• Diarrhoea	4	4	4	3	1	-	4	-	4	8
• Stomatitis	1	-	1	-	-	-	1	-	-	1
• Impaction	1	-	1	-	-	-	-	-	1	1
• Tympany	-	1	-	1	-	-	-	-	1	1
• Rectal haemorrhage	-	1	-	1	-	-	-	-	1	1
2. Surgical affections										
• Wounds & injuries	29	10	18	15	6	-	-	-	39	39
• Lameness/sprain	11	07	04	14	-	-	2	4	12	18
• Tail gangrene	1	-	1	-	-	-	-	-	1	1
3. Skin affections										
• Mange	49	42	41	32	17	1	17	3	71	91
4. Others										
• Conjunctivitis	1	1	1	1	-	-	-	-	2	2
• Avitaminosis	-	1	-	1	-	-	-	-	1	1
• Debility	-	2	1	1	-	-	-	-	2	2
• Pyrexia	1	2	2	1	-	-	1	1	1	3
	102	74	77	74	24	01	25	08	143	176

M : Male B: Bikaneri
 F : Female J: Jaisalmeri
 K : Kachchhi
 AXB : Arab x Bikaneri

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Table 2.10.2. Age and sex wise mortality during 1998-99

Age	Sex	Camel days	No. of animal died	Mortality per 1000 camel days/day
0-3 months	M	818	02	2.4449
	F	367	-	0.0000
	Pooled	1185	02	1.6876
3 months-3 years	M	15550	03	1.1929
	F	16076	01	0.0622
	Pooled	31626	04	0.1265
Above 3 years	M	18146	06	0.3258
	F	39023	03	0.0768
	Pooled	57439	09	0.1567
Overall	M	34784	11	0.3162
	F	55466	04	0.0721
	Pooled	90250	15	0.1662

Table 2.10.3. Breed wise mortality during 1998-99

Breeds	Camel days died	No. of animals 1000 camel days/day	Mortality per	SDR%
Bikaneri	40456	07	0.1730	5.86
Kachchhi	12321	01	0.0812	7.69
Jaisalmeri	31616	07	0.2214	2.77
Arab x Bikaneri	5857	-	0.00	-
Pooled	90250	15	0.1662	6.08

CAMEL HERD STRENGTH (1998-99)

At the beginning of the year the camel herd strength of NRCC farm was 252 and at the end of the year it was 257, comprising of three indigenous breeds and cross bred (Arabi X Bikaneri). The breed wise initial strength of Bikaneri, Jaisalmeri, Kachchhi, Marwari, Sanchori and Cross-breds were 110, 90, 34, 1, 1, and 16 respectively and at the end of the year it was 114, 87, 36, 1, 1 and 18 respectively. During the period addition due to calving was 30 of which 66.7% were male and 33.3% were female calves. During the year genetically superior breeding male camels were distributed at Panchayat level through State Animal Husbandry Department. Three breeding Bikaneri males were added to the farm during this period (Table 2.10.4).

Table 2.10.4. Camel herd strength (1998-99)

Breed/Age	Opening		Calving		Total		Deaths		Disposal		Closing	
	M	F	M	F	M	F	M	F	M	F	M	F
Bikaneri												
upto 3 months	11	10	07	06	18	16	02	-	-	-	16	16
3-12 months	07	11	-	-	07	11	-	-	-	-	07	11
1-3 years	09	03	-	-	09	03	02	01	-	-	07	02
Above 3 years	14	45	03	-	17	45	03	01	02	01	12	43
Total	41	69	10	06	51	75	07	02	02	01	42	72
Jaisalmeri												
upto 3 months	12	08	08	01	20	09	01	-	-	-	19	09
3-12 months	06	07	-	-	06	07	01	-	-	01	05	06
1-3 years	01	06	-	-	01	06	-	-	01	-	-	06
Above 3 years	15	35	-	-	15	35	03	02	01	02	11	31
Total	34	56	08	01	42	57	05	02	02	03	35	52
Kachchhi												
upto 3 months	04	03	02	01	06	04	-	-	-	-	06	04
3-12 months	03	02	-	-	03	02	-	-	-	-	03	02
1-3 years	02	02	-	-	02	02	-	-	-	-	02	02
Above 3 years	09	09	-	-	09	09	01	-	-	-	08	09
Total	18	16	02	01	20	17	01	-	-	-	19	17
Cross bred (Arab x Bikaneri)												
upto 3 months	-	05	01	01	01	06	-	-	-	-	01	06
3-12 months	01	-	-	-	01	-	-	-	-	-	01	-
1-3 years	-	-	-	-	-	-	-	-	-	-	-	-
Above 3 years	01	09	-	-	01	09	-	-	-	-	01	09
Total	02	14	01	01	03	15	-	-	-	-	03	15
Marwari (Adult)	01	-	-	-	01	-	-	-	-	-	01	-
Sanchori (Adult)	01	-	-	-	01	-	-	-	-	-	01	-
Over All Total	97	155	21	09	118	164	13	04	04	04	101	156

M - Male, F - Female

2.11. RANGE LAND MANAGEMENT

The farm area of the Centre is spread over in 824 ha sandy and undulated land. The developmental activities are mainly confined in paddock No. 1 and 2. Sand dunes of varying sizes both parabolic and longitudinal are present in the area.

Trees and pastures were maintained in the range land area and about 4000 tree saplings were introduced during 1998-99.

About 7 ha of pasture area was renovated with blue panic (*Panicum antidotale*). The crops like guar and oat were cultivated in about 12 ha area. The range land area supported about 200 camels grazing regularly for 6 hours.

In order to define the track of camel and protection of tree seedling and regulate camel grazing, thorn fencing was erected along the road side leading to paddock No. 2 of the farm area. Tree guards were erected around the tree saplings in the farm area.

3. TECHNOLOGY ASSESSED AND TRANSFERRED

- 3.1. Package of practices to improve reproductive efficiency.
- 3.2. Package of practices to reduce early calf mortality.
- 3.3. Package of practices for improving camel health.

4. EDUCATION AND TRAINING

- 4.1. Sh. Ram Dayal, T-4 (Library Asstt.) has attended training course on "Computer Applications in Library and Information centres" at NAARM, Hyderabad, from July 27th - Aug. 6th, 1998
- 4.2. Dr. B.P. Mishra, Scientist and Sh. Dinesh Munjal, T-4 Computer Op/Programmer, attended a training for ARIS Incharges, on "Management of Information System" at NAARM, Hyderabad, 7th-18th September, 1998.
- 4.3. Scientist namely Dr. Champak Bhakat, Dr. D. Suchitra Sena and Dr. Nirmala Saini undertook foundation training course for ARS Scientist (64th FOCARS) at NAARM, Hyderabad from July 21st - November 13th, 1998.
- 4.4. Miss Poonam Jayant undertook training course on "Recent advances in mineral metabolism and techniques for their estimation" at IVRI from November 9th-30th, 1998.
- 4.5. Dr. D. Suchitra Sena undertook an advanced training course on "Polymerase chain Reaction and Nucleic acid probes in Animal Disease Diagnosis" at centre for Biotechnology, IVRI, Bareilly, From January 29th - February 18th, 1999.
- 4.6. Dr. Sumant Vyas undertook training course on "Safety aspects in research applications of ionising radiations" at BARC, Mumbai from February, 15th - 23rd, 1999.

5. LINKAGES AND COLLABORATIONS

5.1. National

- ❖ AIIMS, New Delhi : Milk protein especially lactoferrin
- ❖ RAU, Bikaner : Research work of MVSc and Ph.D. students
- ❖ CCSHAU, Hisar : Research work of Ph.D. Student
- ❖ NDRI, Karnal : Camel milk analysis
- ❖ CSWRI, Avikanagar : Camel hair
- ❖ CIAE, Bhopal : Camel drawn implements
- ❖ S.P. Medical College, Bikaner : Camel milk as nutritional adjuvant in treatment of tuberculosis
- ❖ DRDO, Ministry of Defence : Evaluation and conservation of double humped camel.

5.2. International

- ❖ CIRAD-EMVT, France : Research and training

5.3. Externally funded project

- ❖ "Development of Embryo Transfer Technology in Camel" Sponsored by Department of Biotechnology, Ministry of Sciences and Technology, Govt. of India.

6. LIST OF PUBLICATIONS

ARTICLES PUBLISHED

- 6.1. Sahani, M.S. and Rathinasabapathy, M. 1998 The fast dwindling species of Ladakh - A brief note. *Indian Farming*. **48**, July : 13-14.
- 6.2. Sahani, M.S. and Rathinasabapathy, M., Rajender Kumar and Khanna, N.D. 1998. Factors affecting annual hair production in indigenous breeds of camels (*Camelus dromedarius*) under farm conditions. *Indian Journal of Animal Sciences*. **68** : 267-268.
- 6.3. Sahani, M.S. and Rathinasabapathy, M. and Gorakh Mal. 1998. Milking technique and other factors affecting milk production potential in different breeds of camel under farm conditions. *Indian Journal of Animal Sciences*. **68** : 254-256.
- 6.4. Nagpal, A.K., Sahani, M.S. and Roy, A.K., 1998. Growth, feed utilisation efficiency and nutrient utilisation in growing camel calves. *Indian Journal of Animal Production and Management*, **141**-4.
- 6.5. Nagpal, A.K., Kiradoo, B.D., Raja Purohit, Gorakh Mal and Ram Kumar, 1998. Comparative studies on effect of stall-feeding and continuous pasture grassing systems on camel production. *Indian Journal of Animal Nutrition*. **15** : 151-57.

- 6.6. Nagpal, A.K., Sahani, M.S., Roy, A.K. and Gorakh Mal, 1998. Voluntary feed intake and utilisation of macro and micro nutrients in dry and pregnant camels. *Indian Journal of Animal Nutrition*. **15**: 158-62.
- 6.7. Nagpal, A.K., Gorakh Mal, Raja Purohit and Kiradoo, B.D., 1998. Utilisation of Bui (*Aerva tomentosa*) leaves in the ration of camel. *Indian Journal of Animal Nutrition*. **15**:
- 6.8. Nagpal, A.K., Sahani, M.S. and Roy, A.K. and Gorakh Mal, 1998. Voluntary feed intake and utilisation of macro and micro nutrients in dry and lactating Bikaneri camels. *International Journal of Animal Science*, **13**: 19-24.
- 6.9. Vyas, S, Rai, A.K. and Khanna, N.D., 1998. Treatment of cystic ovarian degeneration in Indian camel (*Camelus dromedarius*). *Indian Veterinary Journal*, **75**:827.
- 6.10. Vyas, S, Goswami, P., Rai, A.K. and Khanna, N.D., 1998. Use of tris and lactose extenders in preservation of camel semen at refrigerated temperature. *Indian Veterinary Journal*, **75**:810-12.
- 6.11. Vyas, S, Singh, A.K., Goswami, P., Bissa, U.K., Rai, A.K. and Khanna, N.D., 1998. Superovulation and non surgical embryo flushing in Indian camel (*Camelus dromedarius*). *International Journal of Animal Science*, **13**: 147-78.
- 6.12. Raghvendar, S., Bhatia, K.C. and Sahani, M.S., 1998. Camel Milk - A rich source of protective protein. *ICAR News Letter*. **4**:1,8-9.

7. LIST OF APPROVED ON-GOING PROJECTS

- 7.1 Genetic characterisation, evaluation and conservation of indigenous camel breeds.
- 7.2 Improvement of the working efficiency of camel under arid and semi-arid conditions.
- 7.3 Improvement of reproductive efficiency and to study the causes of reproductive failures in camel.
- 7.4 Studies on feed requirement and feed resource evaluation in camel for optimum production.
- 7.5 Surveillance, monitoring and control of camel disease.
- 7.6 To study the economics of different camel management practices under arid and semi-arid eco-systems.

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

8.1. 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 Science, RAU, Bikaner | : | Member |
| 5. Asstt. Director General (AN&P), ICAR, Krishi Bhawan, New Delhi | : | Member |
| 6. i) Sh. Syed Mujahid Ali Naqui,
152-153, Amarnath Ji Ka Bagechi, Adarsh Nagar, Jaipur | : | Member |
| ii) Sh. Tara Singh, CPI Office, Jaipur | : | Member |
| 7. Finance & Accounts Officer, Centre Institute for Research on Goats Makhdum (UP) | : | Member |
| 8. (i) Dr. S.N. Tandon, Sr. Scientist, NRCC, Bikaner
(ii) Dr. A.K. Nagpal, Scientist (Sr. scale), NRCC, Bikaner
(iii) Dr. Sumant Vyas, Scientist, NRCC, Bikaner | | |
| 9. Assistant Administrative Officer, NRC on Camel, Bikaner | : | Member secretary |

The following members attended the of management committee meeting held on 02.09.98.

1. Sh. Syed Mujahid Ali Naqui, Advocate, Jaipur
2. Dr. G.R. Purohit, Dean, CVAS, Bikaner
3. Dr. S.P. Vyas, Dy. Director, Dept. of AH, Rajasthan
4. Dr. S.N. Tandon, Sr. Scientist, NRC on Camel, Bikaner
5. Dr. A.K. Nagpal, Scientist, NRC on Camel, Bikaner
6. Dr. Sumant Vyas, Scientist, NRC on Camel, Bikaner
7. Sh. Ayaz Ahmed, A.F.Ac.O., NRCAH, Bikaner
8. Sh. Ashok Mallick, AAO, NRC on Camel, Bikaner

Management committee has discussed and approved the following proposals:

1. Approval of the proposal for the purchase of priority equipments i.e. Fluorescence spectrophotometer, NIR system, Kjeldhal Auto-systems of Nitrogen estimation, General lab equipment, Ultra centrifuge, V-SAT for Internet, Deep Fridge (-20°C) vertical model, during the current financial year (1998-99) was made by the management committee.

2. Proposal of priority works to be undertaken for the year 1998-99 was cleared by the Management Committee considering their urgency and importance.
3. The Management Committee also approved the proposal for condemnation of staff car no.RJ-07,1853 and also unanimously agreed the proposal for purchase of camel.

Proposal made by the Management Committee for NRC on Camel, Bikaner :

1. The Deputy Director, Animal Husbandry Dept., Bikaner proposed that many livestock fairs are being organised every year in different parts of Rajasthan. Since the Centre is taking various programmes on camel research, at least one of the concerned Scientist from the Centre may be deputed for conducting detail survey work and to organize Kishan Gostis, which will be beneficial for knowing the problems of camel breeders, prioritisation of research in developing proper liaison with State Animal Husbandry Dept., and camel owners.
2. Mr. Syed Mujahid Ali Naqvi, Advocate proposed to compile a research project report on the following aspects of Indian camels :
 - i) Age wise growth pattern of various camel breeds.
 - ii) Body weights
 - iii) Camel skin
 - iv) Camel milk

The Management Committee members welcomed above both proposals and requested the competent authority for implementation of these proposals.

8.2. SRC MEETING

During the year 1998-99 one half yearly and one yearly scientific review committee meeting were held under the chairmanship of Director of Institute. Experts from different disciplines viz., Dr. Arun Varma, ADG (AN&P), ICAR, DR. D.S. Balian, Ex-DDG (AS), ICAR, Dr. B.C. Patnayak, Ex-Director, CSWRI, Avikanagar, members of QRT also attended in addition to Dr. G.R. Purohit, Dean, CVAS, Bikaner, Dr.K.M.L. Pathak, CVAS, Bikaner and Dr.R.S. Gahlot, CVAS, Bikaner attended the meeting along with scientific and technical staff.

8.3. QRT MEETING

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

- | | | |
|----|--|----------|
| 1. | Dr. D.S. Balain,
Ex - DDG (AS), ICAR
50, Nayayapuri,
Karnal - 132001 | Chairman |
| 2. | Dr. B.C. Patnayak
Ex - Director, CSWRI
S/30, Mitree Vihar,
Chandrashekharapur
Bhubneshwar - 751016 | Member |

3. Dr. P.L. Arya,
Ex. Prof. Pathology, RAU
A/7-A Natraj Nagar,
Jaipur - 332001

4. Dr. Sutaj Bhan Singh Yadav Member
Prof. of Animal Breeding & Genetics
Rajasthan Agriculture University
Bikaner - 334001

5. Dr. Arun Vama Member Secretary
ADG (AN&P), ICAR,
Krishi Bhavan, New Delhi - 110001

The QRT members recommended the following future research areas which should be planned on guidelines of Project Based budgeting :

1. Characterisation, evaluation and conservation of germplasm resources
2. Breeding policies and programmes
3. Work efficiency
4. Nutrition and feeding practices for economic production
5. Camel reproduction
6. Poll gland
7. Health management
8. Camel products and by-products
9. Camel economics and social impact

The members of Review Team suggested :

1. To undertake regular short courses for National and International agencies in the specialized fields viz., camel draughtability, camel reproduction, camel health and disease and camel management.
2. The expansion of infrastructural facilities viz., laboratories, library, camel sheds, range land facilities should be made.
3. There is an urgent need for one post of receptionist, as NRCC is an important tourism centre and revenue generation can be made.
4. A vehicle with trolley is necessary for conducting extension activities.

8.4. RAC MEETING

No Research Advisory Committee meeting was held during the period of 1998-99.

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

- 9.1. Sh. Dinesh Munjal attended First All-India Conference cum Workshop for ARIS Incharge's, 17-18th August, 1998, at New Delhi.
- 9.2. Dr. M.S. Sahani, Dr. Raghvender Singh and Dr. B.P. Mishra attended third annual meeting for Animal Production under Arid conditions at Al-Ain, UAE, 2-3rd May, 1998.
- 9.3. Sh. Dinesh Munjal attended Second All-India ARIS Cell Incharge's Workshop and Seminar on LINUX for ARIS Incharge's, 5-7th March, 1999, at New Delhi.
- 9.4. Dr. S.N. Tandon and Dr. B.P. Mishra attended the group meet on conservation of Tharparkar and Rathi cattle germ plasm at RAU, Bikaner March 8-9th, 1999.
- 9.5. Dr. Raghvendar Singh participated in Hindi meeting "Nagar Rajbhasha Kiryanwan Samithi" on 23rd March, 1999.
- 9.6. Dr. A.K. Nagpal attended the Annual Workshop of Network Collaborative Programme on Crop based Animal Production System at Krishi Bhawan, ICAR, New Delhi on 30th, March 99.

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

- 10.1. An International seminar on "Camel Applied Research and Development" was organised for the first time on 10-11th August, 1998 with the collaboration of RAU, Bikaner.
- 10.2. Kishan Gosthis : During the period of 1998-99 two Kishan Gosthis were organised one at Gadwala village and another one at Lakhusar village. The problems under camel diseases and managemental practices were discussed and answered by the subject matter specialists.
- 10.3. Scientific camel exhibition : Two exhibitions were organised, one at Lalgah Palace on and another at NRC on Camel, during Camel Festival at Bikaner.
- 10.4. Camel health camps : Fore health camps were conducted during 1998-99. Two camps were organised at Gadwala village one at Bajju and one at Lakhusar village. The health related problems were solved during these camps.

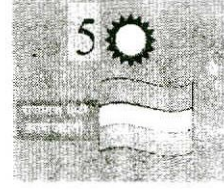


Kishan Gosthi at NRCC

11. DISTINGUISHED VISITORS

The following distinguished personnel visited the Centre during 1998-99.

- ❁ Major General H.S. Kanwar, HQ 24 Inf Div., C/O 56 APO
- ❁ Sh. Niranjana Arya, Collector, Bikaner.
- ❁ Dr. B.B., Banga, Consultant Surgeon, CMC, Hisar.
- ❁ Dr. S.N. Sankhwar, PGIMR, Chandigarh.
- ❁ Dr. Tapas Kr. Saha, PGIMS Lucknow.
- ❁ Dr. R. Kapoor, Add. Prof. Urology, PGIMS, Lucknow.
- ❁ Dr. Mayank Agarwal, Shekhar Hospital, Lucknow.
- ❁ Dr. Arneet Kaur, Chandigarh.
- ❁ Justice S.K. Sinha, Judge, High Court, Calcutta.
- ❁ Sh. Sheekesh Mishra, Senior Sub-Editor, India Today (Hindi).
- ❁ Justice B.I. Shetwa, Judge, Rajasthan High Court, Jodhpur.
- ❁ Dr. Atul R. Mehta, Retd. Professor of Botany, M.S. Univ. Baroda and Consultant Agri. Biotechnology at Baroda and in the USA.
- ❁ Sh. M.K. Zutsih, Chief Commissioner, Customs and Central Excise, MP & Rajasthan, Jaipur.
- ❁ Major General A.K. Vasudev, GTC, 40 Army Div., C/O 56 APO.



राष्ट्रीय उष्ट्र अनुसंधान केन्द्र - कार्यकारी सारांश

5 जुलाई 1984 में स्थापित यह केन्द्र पहले पशु चिकित्सा एवम् पशुविज्ञान महाविद्यालय, बीकानेर तथा राजस्थान के पशु-पालन विभाग के आधीन था। यह बीकानेर शहर से 10 किलोमीटर दूर जोडबीड में स्थित है। केन्द्र में बीकानेरी, जैसलमेरी और कच्छी नरस के कुल 257 ऊंट है।

उपलब्धियाँ

1. बीकानेर, जैसलमेरी, कच्छी नरस के ऊंट समूहों का विकास।
2. आर्थिक रूप से महत्वपूर्ण आनुवांशिक गुणों का निर्धारण।
3. उचित प्रबन्धन द्वारा मृत्युदर को 20-30% (फील्ड दशा में) से 5% तक करना।
4. प्रथम ब्याँत, ब्याँत दर को कम कर प्रजनन क्षमता में सुधार।
5. भारतीय ड्रोमेडेरी ऊंटों में जैव-रसायनिक और रुधिर अध्ययन में आनुवांशिक विभिन्नता नगण्य। परन्तु आर.ए.पी.डी. तकनीक द्वारा विभिन्नता विद्यमान।
6. बोझा ढोने, खेत जोतने की क्षमता, थकावट चिन्ह पर महत्वपूर्ण आधारभूत आंकड़े उत्पन्न करना।

संगठनात्मक स्वरूप

केन्द्र में उष्ट्र फार्म इकाई, अनुसंधान प्रयोगशालाएं, चर भूमि, आवासीय खण्ड और अतिथि गृह सहित 824 हेक्टेयर भूमि है। केन्द्र में वर्ष 98-99 में स्वीकृत पदों की संख्या 76 थी। जिसमें निदेशक सहित वैज्ञानिक (12), प्रशासनिक इकाई में (10) तकनीकी इकाई में, (22) सहायक कर्मचारी (22) सहित कुल 67 अधिकारी/कर्मचारी कार्यरत है।

बजट -

वित्तीय वर्ष 98-99 में योजनामद में 100.00 लाख तथा गैर योजनामद में 78.69 लाख रुपये की धनराशि स्वीकृत की गयी।

परियोजना क्रमांक - (1)

ऊंट के कार्य प्रमाण तथा इन प्रमाणों का भौतिक शारीरिक क्रियाओं एवम् जैव रसायनिक सम्बन्धों पर अध्ययन।

उपपरियोजना 1 - दौड़ के लिए उपयुक्त ऊंट की पहचान, विकास एवम् चुनाव।

4-5 वर्ष के कुल 12 नर एवम् मादा ऊंटों को 6 महीनों तक, 3 कि.मी. सीधे मरुस्थलीय मार्ग पर प्रशिक्षण दिया गया। अधिकतम गति जैसलमेरी एवम् बीकानेरी मादा और नर ऊंटों में क्रमशः 29.4, 28.4, 27.4 और 27.9 कि. प्रति घण्टा पायी गयी तथा दौड़ से पूर्व व पश्चात् श्वसन गति (198, 195) (247,144), नाडी दर (70,59) (54, 84) दर पायी गई। तापक्रम में 6°C प्रतिशत अन्तर पाया गया। रुधिर शर्करा की मात्रा में बढोतरी मादा रेस ऊंटों में (98%) नर (58%) की अपेक्षा (40%) अधिक पायी गयी। क्रिएटिनिन स्तर नर में (62%) मादा रेसऊंटों (22%) से अधिक पाया गया जबकि क्रिएटिनिन काइनेज, लेक्टेट डिहाइड्रोजिनेज एम्जाइम्स की क्रियाशीलता नर व मादा रेस ऊंटों में समान पायी गयी।

उपपरियोजना II - मादा रेस ऊंटों में पोषक तत्वों का उपयोग एवम् निर्धारण

मादा रेस ऊँटों में विश्राम की स्थिति में पोषकता का अध्ययनके लिए उपापचय परीक्षण मोठ चारे आहार पर किया गया। डी.सी.पी. 267 ग्रा./दिन, टी.डी.एन. 3.78 कि./दिन और एम.ई. 56.06 मेगाजूल / दिन की आवश्यकता मापी गयी।

परियोजना क्रमांक (2)

ऊँट के आनुवांशिक गुणों का गुणात्मक एवम् मात्रात्मक अध्ययन।

शारीरिक भार एवम् वृद्धि

जन्म भार व व्यस्क भार अध्ययन में नर बच्चों का भार अधिक पाया गया परन्तु कच्छी बच्चों में सार्थक अन्तर पाया गया। बीकानेरी नस्ल का शारीरिक भार सर्वाधिक उसके बाद कच्छी और जैसलमेरी का पाया गया। जन्म से तीन माह तक प्रतिदिन शारीरिक भार में वृद्धि 3 से 6 महीने की अपेक्षा अधिक पायी गयी।

जनन संबन्धी

प्रजनन की गयी मादा ऊँटों में ग्याभन होने की प्रतिशत दर जैसलमेरी में 72 प्रतिशत, कच्छी में 85.7 प्रतिशत पायी गयी। प्रतिशत ग्याभन दर 77.42 तथा ब्यांत दर 78.38 प्रतिशत थी। ग्याभन होने के लिए दी गयी सर्विस 2.04 थी।

पररूपता अध्ययन

54 नमूने के जैव रसायनिक पर रूपता अध्ययन में हिमोग्लोबिन, ट्रांसफेरिन, एमाईलेज, एल्केलाईज फास्फेटेज लेक्टेट डिहाइड्रोजिनेज, एसिड फास्फेटेज जैसे प्रोटीन/एन्जाइम्स का स्टार्च जैल और पॉलीएक्रीलेमाईड जैल इलेक्ट्रोफोरेसिस से पररूपता नगण्य पायी गयी।

बाल उत्पादन

एक वर्ष एवम् 3-4 वर्ष के तीनों नस्लों के 32 ऊँटों से प्राप्त 127 बाल नमूने बाजू, भीतरी तरफ, कूबड, गर्दन से लिये गये। औसत तन्तु लम्बाई 3.8 से 11.6 सेमी पायी गयी। नस्ल, स्थान, आयु और लिंग का सार्थक प्रभाव पाया गया। शुद्ध, अन्य, बाल और घटिया ऊन की प्रतिशतता 38.56 से 43.49, 34.57 से 40.95, 16.66 से 20.56 और 2.22 से 3.61 प्रतिशत तक थी। एक वर्ष के बच्चों में 3-4 वर्ष के बच्चों की अपेक्षा तन्तु की गुणवत्ता अधिक पायी गयी।

उपपरियोजना I, - भारतीय ऊँटों में आनुवांशिकी अध्ययन

केमेलस ड्रोमेडेरियस का डी. एन. ए. क्लीवेज प्रोफाईल- तीनों नस्ल के नर एवम् मादा ऊँटों का जीनोमिक डी एन. ए. श्वेत रूधिर कणिका से पृथक किया गया। रेसट्रिक्सन एम्जाईम्स Hinf I, Pst I, PvuII, EcorI, से तोड़ने पर विभिन्न प्रकार के रिपीटेटिव डी. एन. ए. बेण्ड प्राप्त हुए, जबकि EcorI, BamHI, से रिपीटेटिव डी. एन.ए. प्राप्त नहीं हुआ। Hinf I, Pst I, PvuII, I से 8.6 और 2 तरह के विभिन्न आकार के रिपीटेटिव DNA बेण्ड प्राप्त हुए। बेण्ड के आणविक आकार पर गहराई से अध्ययन करने पर रिपीटेटिव डी. एन. ए. बेण्ड में नियतता पायी गयी। लिंग, नस्ल के तुलनात्मक अध्ययन पर सभी प्रकार के रेसट्रिक्सन एम्जाईम्स से विभिन्नता नगण्य पायी गयी।

पी. सी. आर. आधारित आर. ए.पी.डी. तकनीक द्वारा केमेलस ड्रोमेडेरियस की आनुवांशिक विभिन्नता का अध्ययन- बीकानेरी, जैसलमेरी व कच्छी पर में आनुवांशिक विभिन्नता के अध्ययन को जारी रखते हुए 10 ओलिगोप्राईमर पी. सी. आर-आर ए.पी.डी. तकनीक में काम में लिये गये। GT-10, OP-08, व G-2 से एग्राज जैल में 6 से 10 DNA बेण्ड प्राप्त हुए। पूर्व में किये गये अनुसंधान परिणामों की पुष्टि करते हुए, ये ड्रोमेडेरियन ऊँटों में आनुवांशिक विभिन्नता/नस्ल विभिन्नता को दर्शाने के लिए महत्वपूर्ण मार्कर साबित हो सकते हैं।

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उपपरियोजना II – दूध दूहने की तकनीक एवम् दूध उत्पादन क्षमता और दूधकाल को प्रभावित करने वाले अन्य कारक— प्रथम, द्वितीय, तृतीय ब्याँत की तीनों नस्लों की पांच दुधारू ऊँटनियों में दूध उत्पादन 12 घण्टे के अन्तराल पर रिकार्ड किया गया। चारों थनों को एक साथ दुहने की अपेक्षा दो थनों को दुहने पर अधिक दूध उत्पादन हुआ। ब्याँत काल का दूध दूहने की दोनों तकनीक पर सार्थक प्रभाव देखा गया तथा दूधकाल में 7 वें महीने पर प्रतिदिन अधिकतम दूध उत्पादन पाया गया इससे निष्कर्ष निकाला गया कि नस्ल का दूध उत्पादन क्षमता पर प्रभाव पड़ता है। अगर बच्चे को दूध से अलग न किया जावे तो दूधकाल अर्थात् 16 महीने तक जारी रहती है।

परियोजना क्रमांक (3)

ऊँटों के रखरखाव का उचित प्रबन्धन – इस परियोजना के अन्तर्गत बीकानेर तहसील के चार विभिन्न गांवों (बज्जू, लक्खासर, केसरदेसर, गाढ़वाला) का सर्वे किया गया। 64 ऊँट पालकों से उनकी आर्थिक स्थिति, खेती, ऊँट उत्पादन पद्धति के आय के बारे में जानकारी प्राप्त की गयी। अधिकतर ऊँट पालक ऊँटों को अर्धसघन चराई पर रखते हैं। मोट, ग्वार फलगटी चारा मुख्य तौर पर खिलाया जाता है। 8-10 घण्टे तक बोझा ढोने का कार्य लिया जाता है। आमतौर पर खेती के लिए साल में 60 दिन (30 रबी, 30 खरीफ) काम में लिया जाता है। दुग्धकाल 8-10 महीने तक रहता है। सम्पूर्ण दूध का उपयोग केवल टोरडा/टोरडी को पिलाने में किया जाता है। गांवों में परजीवी खाज ही मुख्य बीमारी पायी गयी। बच्चों में मृत्युदर 21.34 से 38.09 प्रतिशत तथा व्यस्क ऊँटों में 4.21 से 7.00 प्रतिशत पायी गयी।

परियोजना क्रमांक (4)

ऊँट पोषण पर अध्ययन

उपपरियोजना I – मदकाल में नर ऊँटों में सान्द्र गोलिका आहार का पोषक तत्वों के उपयोग और सीरम प्रोकाईन पर अध्ययन— 6 व्यस्क नर ऊँटों को 68 दिन तक मोट चारा खिलाया गया। ग्रुप I (कन्ट्रोल) को 5 लि. तिली का तेल तथा 1 किलो गुड़, ग्रुप II को 2 किलो सान्द्र गोलिका आहार दिया गया। ग्रुप I में 40 कि. तथा II में 5 कि. भार की कमी हुई। प्रयोग में सान्द्र आहार को आर्थिक दृष्टि से सस्ता एवम् पोषक तत्वों की ग्रहणता, उपयोगिता, शारीरिक भार की कमी कम करने में उपयोगी पाया गया।

परियोजना क्रमांक (5)

ऊँट प्रजनन पर अध्ययन

उपपरियोजना I—ब्याँत के तुरन्त बाद अण्डकोश की सक्रियता और जनन पर अध्ययन— ब्याँत के तुरन्त बाद मेंटिंग की संभावना का पता लगाने के लिए अण्डकोश की स्थिति जानने के लिए प्रयोग किया गया। 17 ऊँटनियों में 30, 45, 60, 75, 90 दिनों के बाद अल्ट्रासाउण्ड स्केनर 2000 द्वारा निरीक्षण किया गया। केवल 9 ऊँटनियों में 1 से.मी. से अधिक व्यास के अण्डकोष देखे गये। 4 ऊँटनियों को गर्भित करने में सफलता मिली।

उपपरियोजना II – ऊँटों में तारुण्य की शीघ्रता— ऊँटों में तारुण्य की उम्र 4-6 वर्ष होती है। इस उम्र को कम करने के लिए ग्रुप I पोरसाईन एफ. एस. एच-पिट्यटरी (सुपर ओवी) और ग्रुप II क्लोमीफीन साइट्रेट (साईफीन) साइट्रेट द्वारा उपचार किया गया। ग्रुप I में 11 ऊँटनियों में से आठ ग्रुप I में केवल एक ऊँटनी गर्भित हुई।

उपपरियोजना III – गैर ऋतु प्रजनन— यह प्रयोग गैर ऋतु में प्रजनन की क्षमता बढ़ाने के लिए मई-जून के महीने में किया गया। 25 ऊँटों में अल्ट्रा साउण्ड परीक्षण पर केवल 14 ऊँटनियों के अण्डकोष में अण्डपुष्टिका (फोलिकल्स) पाये गये। मेंटिंग से दो ऊँटनिया गर्भित हुई। इस प्रयोग से यह इंगित होता है कि गर्भियों में नर ऊँटों की प्रजनन क्षमता में सुधार की आवश्यकता है।

परियोजना क्रमांक (6)

ऊंट बीमारियों का पर्यवेक्षण, निगरानी, नियन्त्रण

उपपरियोजना I - ऊंटों में परजीवी खुजली रोग की व्यापकता और उपचार- वर्ष 1991-1997 के दौरान फार्म के ऊंटों पर उम्र लिंग, नस्ल का खुजली पर प्रभाव तथा व्यापकता का अध्ययन किया गया। इससे लिंग एवम् उम्र का प्रभाव सार्थक पाया गया। सबसे अधिक खुजली सितम्बर से अक्टूबर में (59%) पायी गयी है। उपचार के लिये किये गये प्रयोग में द्रव अमीतराज 12.5% (10 मिली. 5 लिटर में) का सप्ताह अन्तराल में दो बार प्रयोग हिमेक्स लोशन (5 दिन के अन्तराल पर तीन बार) से ज्यादा लाभप्रद और सस्ता पाया गया।

उपपरियोजना II - ऊंटों में उदर आंत्र परजीवी की व्यापकता पर अध्ययन- फार्म के ऊंटों में परजीवी संक्रमण अध्ययन में मुख्यतया स्ट्रागाइलसिस संक्रमण पाया गया। इसमें उम्र, लिंग नस्ल का प्रभाव सार्थक पाया गया। तीव्रता। ग्राम मल में अण्डों की संख्या से ज्ञात की गयी जो कि 56, 32, 31.03 और 12.64 प्रतिशत क्रमशः 100, 100-1000 और 1000 से अधिक थी।

उपपरियोजना III - ऊंट के दूध का क्षय रोग पर प्रभाव- सरदार वल्लभ पटेल चिकित्सा महाविद्यालय के क्षय व छाती रोग विभाग के सहयोग से तीन प्रकार के क्षय रोगियों बिना उपचार के क्षय रोगी गुप। फेफड़ों में मवाद पड़े क्षय रोगी, दीर्घकालीन फेफड़े वाले क्षय रोगी में अनुसंधान किया। उपचार के लिए दी गयी दवाईयों के साथ-साथ ऊंटनी का कच्चा दूध। किलो। दिन में तीन बार पिलाया गया। तीन माह बाद गुप। में ब्राह्म लक्षण जैसे- खासी, थुक में खुन, सांस में तकलीफ दर्द, ज्वर, भूख आदि सामान्य पाये गये।

भूख में बढ़ोतरी सिर्फ ऊंटनी का दूध पीने वाले रोगियों में हुई तथा भार में करीब 14% की वृद्धि, जस्ते की अधिक मात्रा, फेफड़ों के आकार में वृद्धि, लाल रुधिर कणिका के बढ़ने की दर 77.2% तथा कुल श्वेत कोशिकाओं की संख्या (53.68) प्रतिशत गाय का दूध पीने वालों से अधिक थी। गुप II में मवाद निकलना बन्द हो गया जबकि गाय का दूध पीने वाले रोगियों में मवाद बनना खत्म नहीं हुआ। गुप III के रोगियों में ऊंटनी के दूध से भूख और हिमोग्लोबिन की मात्रा में वृद्धि पायी गयी। इस प्रकार ऊंटनी के दूध से टी.बी. बीमारी में तेज गति से लाभ होता है।

अनुसंधान योजनाएं

अनुसंधान योजना (1) - फसल आधारित पशु उत्पादन नेटवर्क सहयोगिक कार्यक्रम-

उपयोजना I - ग्रेमना चरागाह और चारागाह चाराई प्रबन्धन सिस्टम का ऊंट के बच्चों पर तुलनात्मक प्रभाव- ऊंट चराई से वनस्पति, उर्वरा शक्ति पर पड़ने वाले प्रभाव तथा लम्बे समय तक पोषण देने वाली चराई व्यवस्था के लिए अनुसंधान किया गया। ग्रेमना युक्त 4-5 हेक्टेअयर से 16000 कि./हे. हरी एवम् 3200 कि./हे. शुष्क ग्रेमना प्राप्त हुई। और इस ग्रेमना प्राप्ति पर 5 टोरडे/टोरडी, शारीरिक भार का 2 प्रतिशत शुष्क पदार्थ की आवश्यकतानुसार 128 दिन तक रखा जा सकता है। गुप 1 में 22 बच्चों को 7 घण्टे चराई पर रखा गया। प्रयोग 74 दिन तक (अगस्त से अक्टुबर 98) चला। अगस्त महीने में चरागाह सूखने के कारण बच्चों को 7.2 कि./दिन ग्वार फलगटी दी गयी। गुप 2 को भी भार की कमी को देखते हुए बाड़ वाले 11 हे. भूमि पर स्थानान्तरित किया गया। भूमि की उर्वरा शक्ति पर प्रयोग से पूर्व पश्चात् कोई अन्तर नहीं पाया गया।

उपयोजना II - ऊंट के बच्चों द्वारा सेवन, सेवन + अरडू पतियों का उपयोग- 5 बीकानेरी ऊंट (2 वर्ष, भार 297. 2 + 8.60 कि.) को महीने भर सूखी सेवन घास खिलाई गयी। बाद में 1 किलो/ दिन सूखी अरडू पतियां खिलाई गयी। उसका शुष्क पदार्थ 2.19 + 0.22 से 3.36 + 0.12 कि./दिन तथा शारीरिक भार 0.78 + 0.08 से 1.18कि./100 कि. बढ़ा इस प्रकार सेवन घास के साथ अरडू पतियां खिलाने पर पोषक तत्वों के उपयोग तथा शारीरिक भार में वृद्धि पर धनात्मक प्रभाव पड़ा।

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अनुसंधान योजना (2) - ठण्डे मरुरथल में दो कूबड़ वाले ऊंटों का मूल्यांकन एवम् संरक्षण

एफ आर एल- डीइटी परतापुर (लदाख) में ऊंट शालिका, खाद्य पदार्थ-शालिका तारों की बाढ का कार्य पूरा कर लिया गया। ऊंटों की संख्या, व्यवहार, जनन, प्रबन्धन के बारे में जानकारी प्राप्त की गयी। दो कूबड़ वाले ऊंटों से प्राप्त रुधिर नमूने में रुधिर और जैव रसायनिक परीक्षण जैसे सीरम एलडीएच, जीपीटी जीओटी, डाइग्लिसराईड, कुल प्रोटीन, यूरिया, ऐल्बुमिन, क्लेशियम, पोटेशियम, मैग्नीशियम, सोडियम स्तर का ड्रोमेडेरियन से तुलना पर लगभग समानता पायी गयी। सीरम यूरिया दो कुबड़ ऊंटों में (32.381 ± 2.0) एक कुबड़ की तुलना में $(23.31 + 1.44)$ अधिक पायी गयी। सीरम यूरिया बालों के नमूने के अध्ययन पर सबसे अधिक माध्य तन्तु लम्बाई कुबड़ (13.61 सेमी) फिर गर्दन और मध्य तरफ (6.48 सेमी) नापी गयी। व्यस्क दो कूबड़ वाले ऊंटों में अमज्जा युक्त तन्तु की अधिकता (64.9%) के कारण यह तन्तु प्रोसेसिंग में बहुत उपयोगी है। शारीरिक लम्बाई, टांगों की लम्बाई और ऊंचाई नर व मादा में सार्थक रूप से विभिन्नता नापी गयी। एक कूबड़ वाले ऊंटों की तुलना में दो कूबड़ वाले ऊंट छोटे जबकि शरीर की लम्बाई व चौड़ाई लगभग समान नापी गयी।

पीसी आर-आर एपीडी विश्लेषण द्वारा जीनोनिक डी. एन. ए. पृथक्करण - तकनीक द्वारा दोनों लिंगों के 5 बेक्टीरियन ऊंटों के रुधिर श्वेत कणिकाओं से जीनोनिक डी एन ए अलग किया गया। प्रारम्भिक अनुसंधान से दोनों नस्लों में आनुवांशिक भिन्नता पायी गयी है।

अन्य अनुसंधान

ऊंट के दूध की भौतिक-रसायनिक गुणों का अध्ययन- व्यँत के 1 से 7 दिन बाद दूध में होने वाले अन्तर का अध्ययन करने पर मालूम हुआ कि कूल ठोस, राख, लेक्टोज और प्रोटीन की मात्रा पहले दिन अधिक थी और 7 दिन तक लेक्टोज प्रोटीन मात्रा सामान्य दूध की तुलना में अधिक पाया गया कोलेस्ट्रम में वसा 2.89% लेक्टोज 5.49 से 6.11 प्रतिशत 5.97 से 6.7 प्रतिशत पाया गया। निष्कर्ष निकाला गया कि 7 दिन तक कोलेस्ट्रम सामान्य दूध में नहीं बदलता है।

अंतर-संस्थीय सहयोग

(I) ड्रोमेडेरियन ऊंटों में तरल धारण का हरमोन व वृक्क द्वारा रेग्यूलेशन- सर्दियों में आठ ऊंटों को तीन ग्रुप कन्ट्रोल, डिहाइड्रेटेड (बिना पानी 24 दिन तक) रिहाइड्रेटेड में विभक्त कर अध्ययन किया गया। निर्जलीकरण से शारीरिक भार में 33 प्रतिशत कमी हुई। कुल सीरम प्रोटीन, ग्लूकोज, यूरिया, क्रिएटिनिन, सीरम इलेक्ट्रोलाइट का मध्यमान निर्जलीकरण में 16 दिन तक बढ़े। ग्लूकोज टोलरेन्स परीक्षण में ग्लूकोज स्तर 129.21 से 441.09 मिग्रा/डैसी लि. बढ़ा। आगे अनुसंधान जारी है।

(II) ऊंट के लेक्टोफेरिन्स के भौतिक, रसायनिक और प्रतिरक्षा गुण का अध्ययन- ऊंट के लेक्टोफेरिन्स को एसिड व्हे से अलग कर परिष्कृत किया गया। एसडीएल जैल इलेक्ट्रोफोरेसिस से आणविक भार 78 कि. डाल्टन प्राप्त हुआ। प्रोटीन में 0.16 प्रतिशत आयनन था। बीकानेरी नस्ल के दूध में लेक्टोफेरिन्स की मात्रा 0.95-2.5 मिग्रा/मी. थी। ऊंट दूध लेक्टोफेरिन्स खरगोश में टीकाकरण प्रतिरोधी क्षमता विकसित की गयी। इम्यूनोग्लोबिन प्रोफाइल से गाय के दूध एवम् ऊंट के दूध लेक्टोफेरिन्स में प्रतिजनिक समानता नहीं पायी गयी। जीवाणु परीक्षण करने पर पता चला है कि ऊंट दूध लेक्टोफेरिन्स अन्य लेक्टोफेरिन्स की तरह ई. कोलाई जीवाणु की वृद्धि रोकता है। ऊंट व बकरी दूध के लेक्टोफेरिन्स में 40 कि.डा. से कम आणविक भार के दो पेटिटक खण्ड मिले हैं। लेक्टोफेरिन्स में दो चोडे भिन्न बेण्ड पी आई 4.7 और 6.2 होना लेक्टोफेरिन्स अणु में विभिन्नता दर्शाता है।

हयालोमा एनाटोलिकम एनाटोलिकम किलनी के मध्य आंत के प्रतिजनों का लक्षण वर्णन तथा उनका खरगोश व मवेशियों में रोधक्षमता में प्रभाव

हयालोमा एनाटोलिकम एनाटोलिकम मादा किलनी की मध्य आंत से चार प्रकार के प्रतिजन तैयार किये गये। इन चारों प्रतिजन का खरगोशों में टीकाकरण किया गया। प्रतिरोधी खरगोशों पर किलनी के लार्वा व व्यस्क अवस्था में रक्त

चुसने की प्रतिक्रिया में उल्लेखनीय कमी पायी गयी। सबसे अधिक प्रतिरोधी क्षमता धुलनशील मध्य आंत प्रतिजन द्वारा उत्पन्न की गयी। इस प्रतिजन को प्रभाजन व शोधन के पश्चात संकर नस्ल के मवेशियों में लगाया गया। प्रतिरोधी मवेशियों में प्रभावपूर्ण प्रतिरोधी क्षमता देखी गयी। एज.डी.एस.पेज तकनीक द्वारा इस प्रतिजन में 26 प्रोटीन पाये गये जिनका आणविक भार 25-200 किलो डालटन तक था। इम्यूनोब्लोटिंग तकनीक द्वारा 26 प्रोटीन्स में 8 प्रतिरोधी प्रोटीन की पहचान की गयी। किलनियों की आंतों का इलेक्ट्रॉन सूक्ष्मदर्शी द्वारा अध्ययन पर प्रतिरोधी क्षमता का आंतों को नष्ट करने में सार्थक प्रभाव देखा गया।

ऊँट स्वास्थ्य प्रबन्धन

वर्ष 98-99 में 176 पीडित ऊँटों का उपचार किया गया। जिसमें 19 पाचन संबन्धी, 58 शल्य और 90 चमडी रोग सम्बन्धी थे। वर्ष 98-99 में स्पेशिफिक मृत्यु दर (एस.डी.आर.) 6.08 थी।

बचाव और उपाय— ट्रिपेनोसोमियसिस से बचाव के लिए क्वीनापाईरेमिन टीकाकरण किया गया। बाह्य परजीवी व अंतः परजीवी की रोकथाम हेतु वर्ष में दो बार कीटनाशक का स्प्रे एवं डिवार्मिंग की गयी।

चरागाह भूमि प्रबन्धन

केन्द्र की कूल 824 हेक्टर भूमि में अधिकतर रेतीली और असमतल है। अधिकतर गतिविधियाँ एरिया नं. 2 में सीमित रही। 4000 नये पौधे लगाये गये। 7 हेक्टर भूमि पर बल्युपेनिक घास नं. 2 लगायी गयी। 12 हेक्टर भूमि पर ग्वार, ज्वार की खेती की गयी। चराई भूमि पर 200 ऊँटों को लगातार 6 घण्टे बल्युपेनिक चराई पर रखा गया। एरिया नं. 2 में सड़क के साथ-साथ कांटों की बाढ़ की गयी।

तकनीक विकसित एवम् प्रसार

1. प्रजनन क्षमता सुधार के लिए पद्धति
2. बच्चे में मृत्युदर को कम करने की पैकेज पद्धति
3. ऊँट स्वास्थ्य में सुधार के लिए पैकेज पद्धति

राष्ट्रीय अन्तराष्ट्रीय सहयोग -

- | | |
|--|---|
| 1. अखिल भारतीय आयुर्विज्ञान संस्थान | — उच्च प्रोटीन विशेषतथा लेक्टोफेरिन्स |
| 2. राजस्थान कृषि विश्वविद्यालय | — एम.वी.एस.सी. पी.एच.डी. अनुसंधान कार्य |
| 3. सी.सी.एस. हरियाणा कृषि विश्वविद्यालय | — पी.एच.डी. कार्य |
| 4. राष्ट्रीय डेरी अनुसंधान संस्थान - करनाल | — ऊँट दूध विश्लेषण |
| 5. केन्द्रीय भेड़ ऊन अनुसंधान संस्थान - अविकानगर | — ऊँट ऊन पर |
| 6. सी.आई.ए.ई - भोपाल | — ऊँट द्वारा खींचे गये गाढ़े पर |
| 7. एस.पी.मेडीकल कॉलेज, बीकानेर | — ऊँट दूध पर |
| 8. डी.आर.डी.ओ. - रक्षा मंत्रालय | — दो कूवड के ऊँट का मूल्यांकन एवं संरक्षण |

अंतराष्ट्रीय सहयोग

सी.आई.आर.डी. - ई.एम.वी.टी. - फ्रांस - अनुसंधान और प्रशिक्षण

प्रसार गतिविधियाँ

1. केन्द्र में एक उष्ट्र संग्रहालय बनाया गया।
2. गाढ़वाला में चार उष्ट्र स्वास्थ्य केम्प लगाये गये।
3. उष्ट्र उत्सव पर देश-विदेश से आने वाले आगन्तुक के लिए प्रदर्शनी लगायी गयी।

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4. चार नये हिन्दी के प्रकाशन किसानों और प्रसार एजेन्सी के लिए वितरित किये गये।

प्रकाशन— वर्ष 1998-99 में 12 शोध पत्र प्रकाशित हुए। वर्ष 98-99 में प्रबन्ध समिति की बैठक दिनांक 2-9-98 को सम्पन्न हुई। वैज्ञानिक शोध समिति की दो एवम् पांचवर्षीय समीक्षा दल की एक बैठक सम्पन्न हुई।

सेमीनार, गोष्ठी, प्रदर्शन केम्प का आयोजन

- (1) ऊंटों पर राष्ट्रीय सेमीनार—ऊंटों पर व्यावहारिक अनुसंधान और विकास पहली बार 10-11 अगस्त 98 को राजस्थान कृषि विश्वविद्यालय के सहयोग से आयोजित की गयी।
- (2) लक्खुसर और गाढवाला गांव में दो किसान गोष्ठी आयोजित की गयी।
- (3) ऊंट प्रदर्शनी :- दो ऊंट प्रदर्शनी दिनांक 10-11 अगस्त 98 में लालगढ महल और दूसरी ऊंट उत्सव पर केन्द्र में लगायी गयी।
- (4) चार ऊंट केम्प क्रमशः गाढवाला, बज्जू, लक्खुसर गांव में लगाये गये।

हिन्दी अनुभाग : केन्द्र में 15 सितम्बर से 25 सितम्बर 1998 की अवधि में हिन्दी पखवाड़ा मनाया गया। इस अवसर पर हिन्दी निबन्ध प्रतियोगिता, टिप्पणी का प्रारूप लेखन परीक्षा, श्रुति लेखन परीक्षा आदि प्रतियोगिताओं का आयोजन किया गया। प्रतियोगिता विजेताओं और हिन्दी में विशेष कार्य करने वाली ईकाई को पुरस्कार के रूप में शीलद प्रदान की गयी।

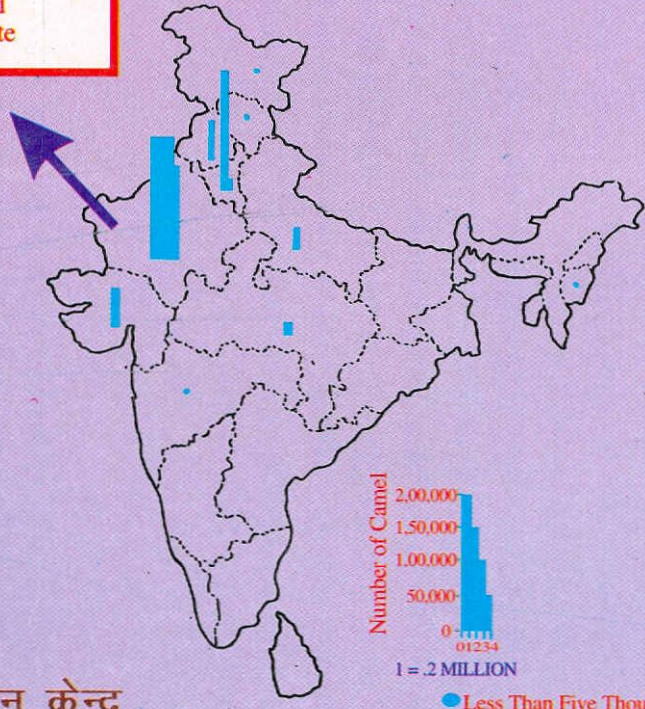
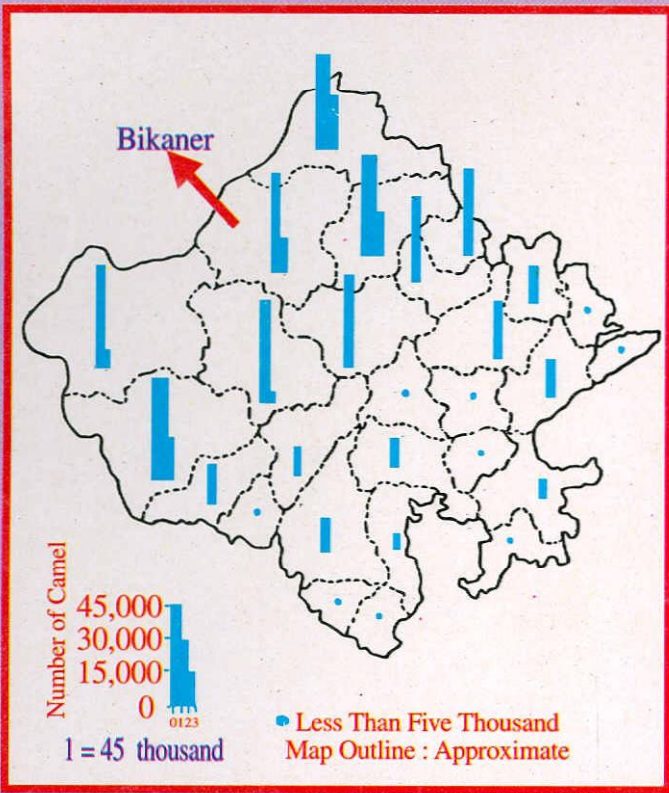
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Venue of International Seminar-Lalgarh Palace



Inaugural Session



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