वार्षिक प्रतिवेदन
Annual Report
2011-12

निदेशक - डॉ. एन. वी. पाटिल
Director – Dr. N. V. Patil

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र
(भारतीय कृषि अनुसंधान परिषद्)
जोड़बीड़, बीकानेर–334 001, राजस्थान, भारत
National Research Centre on Camel
(Indian Council of Agricultural Research)
Jorbeer, Bikaner-334 001, Rajasthan, India

Camel as integral part of livestock farming in hilly tract of Rajasthan

Camel herd in Kachchh region of Gujarat

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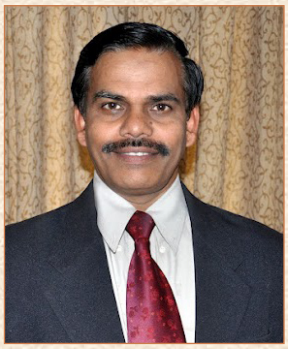
SCIENTIST- STAKEHOLDER MEETS AT THE CENTRE

Preface



It is gratifying to present the scientific achievements and development efforts of NRCC for the year 2011-12 in the form of Annual Report. The basic and applied researches were undertaken by the Centre following the recommendations of Research Advisory Committee and those proposed in Vision documents of the centre whereas research infrastructure and other developmental works were initiated due to active suggestions emerged from the meetings like Institute Management Committee, interactions with the dignitaries visiting the Centre, Participatory Meetings with different Stakeholders, Brain Storming Sessions and Monthly Meetings with the scientists and staff. As a result of team effort of scientists and technical, administrative supporting staff the output for research, development and extension of technologies was possible in the fields of Camel Nutrition, Breeding & Genetics, Reproduction, Health, Physiology, Biochemistry, Value Addition, Camel Management, Agricultural Farm and Agro-Forestry.

The major research achievements included successful amplification, cloning and sequencing of identified 6 promoters or corresponding exonic regions, viz. α_{s2} casein, β-casein 1, β casein 2, lactophorin, α-lactalbumin, peptidoglycan recognition protein responsible for milk production in dromedary. Amplification and cloning of Heat Shock Protein genes (HSP70 A1A and HSP 70A1B) . Development of body condition scores in camels on the basis of 5 point scale for different physiological stages. In male reproduction bio-stimulation had positive effect on reproductive behaviors during the peak non-breeding season (July and August) whereas in females the relation between follicle size and natural mating was studied to indicate that the male camel has ability to select female camels with appropriate follicle size for mating.

Variety of products developed were Sandesh, Raabri, Chocolate, Sweet lassi, Frozen yoghurt and Spray dried powder from camel milk with good acceptability to assess commercial viability of these products.

Molecular characterization of transferrin receptor gene was done to know the drug trafficking against *T. evansi*. The study of cysteine protease gene which can be exploited as diagnostic marker and drug target of trypanosomes was amplified and identified on the basis of its size homology with that of *T. evansi* cysteine protease gene *i.e*. 324bp.The RNA binding protein (RBP) gene, Uracil DNA glycosylase (UDG), IL-10 and GM-CSF inhibitor and Virion Core Protein (VCP) of pseudocowpox virus isolates from Indian dromedary camels were sequenced. Further 6L, 201R, 11R genes and Toll-like receptor inhibitor of camel pox virus were amplified, cloned, and sequenced. Cytokine gene IL-10 of the dromedary camel was amplified from Con–A stimulated peripheral blood mononuclear cells and sub cloning of the dromedary camel IL-2 gene in pPIC-Z alpha (a) vector was achieved. Electroporation of the same into GS115 yeast cells was carried out. Toll Like Receptor (TLR-2) was amplified and cloned into pGEM-T vector. Camel tick gene -Calreticulin (CRT) was amplified, cloned and sequenced. In phylogenetic tree, the CRT gene of camel tick (*Hyalomma dromedarii*) was found to be closely related with *Hyalomma excavatum* and distantly with *Dermacenter andersoni* and *Hyalomma qinghaiensis.* The percentage of identity of nucleotide sequence was more than 90 %.

The presence of antibodies in the camel serum against hTg was confirmed. The cDNA template was used to amplify the region between VhH and CH2 domain of camel immunoglobulin using primers CH2FORTA4 and VHBACKA6. The 600bp band which is devoid of coding sequence for CH1 domain

and corresponding to heavy- chain antibodies were used as template for further amplifying the VhH portion of the immunoglobulin. The nested PCR yielded amplicons of 450 to 520bp, which corresponds to the coding sequence of VhH.

Supplementary feeding during last 3 months of gestation of camels with 2 Kg of complete feed pellets of 10% CP and 62% TDN along with grazing was responsible for optimum calving performance. Whereas in calves reared under silvi-pasture system and the supplementary feeding of same feed resulted in better weight gains. The male calves of above 2 years age reared under intensive feeding system had better gain and better feed conversion efficiency on complete feed pellets containing 9.80% CP (Gr-1), than calves fed on 12.91 % CP (group Gr-2) and 15.82 % CP (Gr-3) diets with possible signs of rut. Molecular characterization and DNA isolation of 12 cellulolytic bacterial isolates from camel rumen yielded DNA of high purity. The DNA amplification and purification was done. Pyrosequencing and Sequence Analysis using 454 Life Sciences technology based high throughput sequencer (GS FLX Roche) of genomic DNA from rumen fluid was done and data analysis using Metagenomics RAST server 3.0 revealed that Bacteroidetes (> 50%) were major phyla followed by Firmicutes and then Proteobacteria with varying percentage. The other phyla showed < 2 percent of hits. *In vitro* studies of feeds and fodders viz., 4 fodder samples (Bajra kadbi, Barley straw, Guar phlagati, Groundnut haulms) and feed pellets of varying CP using camel rumen liquor was done for measuring total gas, VFA fractionation, IVDM and Total-N concentration.The association effect of tanniniferous plants khejri (*Prosopis cineraria*) leaves as with Moth (*Phaseolus acontifolius*) chara as basic diet of camel feed was indicating its effect on degradability, *in vitro* digestibility and also on *in vivo* performance. Study of thermo-adaptive behaviour to know climate adaptability indicated better adaptability of camels during morning than in the evening hours.

To cater the need of society engaged in Camel husbandry, various activities of extension were organised in the form of holding 5 exhibitions, 5 milk competitions and Camel Health Camps. Specialised activity of camel health management and Kisan Goshthis in the tribal areas of Banswara and Dungarpur districts of Rajasthan and Leh-Ladakh region of J&K were organised under Tribal Sub-Plan Special events like camel milking, racing, carting, dance shows etc. for general public during foundation day celebrations were held. Weekly ambulatory clinic facility for the people involved in camel rearing is also a regular activity run by the centre.

The Centre was instrumental in providing research training to the international research scholars/ scientists from Italy, Germany, France and Egypt in the fields of Camel Reproduction, Management and Nutrition. The Centre developed the facilities of milk processing like for Milk Pasteurization, Spray drying with concentration and Milk Analyzer. Similarly, the renovation works for the laboratory buildings have been initiated.

I feel happy for the dedicated group efforts put in by all the scientists, technical and administrative staff which could make it possible to bring the report in present form. The efforts of publication committee are also worthy of appreciation. The Research Advisory Committee under the Chairmanship of Dr. Nagendra Sharma, Ex-Vice Chancellor, SKUAST, Jammu had been of great help in providing direction to research activities under various themes.

I am highly indebted to Dr. S. Ayyappan, Secretary, DARE and DG, ICAR for valuable guidance, support and encouragement. I express my sincere gratitude to Dr. K.M.L. Pathak, DDG(AS), ICAR for active advice, encouragement and support for research and development activities of the Centre. The timely cooperation and valuable guidance received from the ADGs Dr. C.S. Prasad, ADG(AN&P) and Dr. B.S. Prakash, ADG(AN&P), Dr. Gaya Prasad, ADG(AH), Dr. S.C. Gupta, ADG(AP&B) is acknowledged. It is expected that the information presented in the Annual Report will be of help for the professionals and the institutions involved in Camel research and development in the Country and the World.

(N.V.Patil)
Director

1. Executive Summary

On 1st April 2011 the herd strength of camels at the Centre was 365. During the year 2011-12, 49 calves were born and 3 camels of Bikaneri breed were purchased, 20 camels were auctioned and 14 camels died, and closing balance of camels on 31st March 2012 was 383.

During this year the average daily milk production was 2474.63±9.86 ml with 2338.54±16.50 ml in Bikaneri, 2590.17±19.25 ml in Kachchhi and 2495.18±15.23 ml in Mewari. The highest production was in 4th lactation (2695 ml) followed by 3rd (2569 ml), 2nd (2247 ml) and 1st (2010 ml). The effect of breed and months was highly significant. Six promoters or corresponding exonic regions, viz. α_{s2} casein, β-casein 1, β casein 2, lactophorin, α-lactalbumin, peptidoglycan recognition protein were successfully amplified, cloned and sequenced in the dromedary.

The body condition scores in camels of different physiological stages like new born, growing (1-2 yr), adult (3-6 yr) and aged (>6 yr) were recorded on the basis of five point scale. And different physiological, biochemical parameters including milk composition were studied for different body condition scores. Amplification and cloning of Heat Shock Protein genes (HSP70 A1A and HSP 70A1B) of the dromedary camel were successfully carried out from peripheral blood mononuclear cells and submitted for sequencing.

Bio-stimulation was found to have positive effect on reproductive behaviors in male camels during the peak non-breeding season (July and August). The relation between follicle size and natural mating was studied and it was found that the male camel has ability to select female camels with appropriate follicle size for mating.

Different value added products like sandesh, raabri, chocolate, sweet lassi, frozen yoghurt and spray dried powder were successfully prepared from camel milk with good acceptability. The commercial viability of these products is being assessed.

During the Camel Health Camps organized at Bikaner, Jaisalmer, Udaipur, Jhunjunu, Banswara and Dungarpur districts different biological samples from camels were collected and cases of Trypanosomosis, Mange, GI nematodiasis, Coccidiosis, Hydatidosis were observed. The cause of morbidity and mortality in clinical cases at Centre during the period of April 2011 to March 2012 were investigated. Trypanosomiasis infected pregnant females showed abortions and premature births in second half of gestation. The aborted foetuses revealed congestion and hemorrhagic internal organs especially in kidney and brain. The aborted foetal heart blood and impression smears from lung, liver, spleen and brain were found positive for trypanosome infections. The PCR using ribosomal gene primers revealed active carrier stage of *T. evansi* infection in some farmer's herd. Molecular characterization of transferrin receptor gene was done to exploit further the drug trafficking against *T. evansi* infection. The cysteine protease gene of trypanosomes was exploited for identification of diagnostic marker and drug target of this parasite. The gene was amplified and identified on the basis of its size homology with that of *T. evansi* cysteine protease gene *i.e.* 324bp. The different types of GI infections recorded in camels were *Strongyles*, like *Haemonchus*, *Trichostrongylus*, *Strongyloides*, *Trichuris*, *Monezia* spp. Total 349 clinical cases were attended during different seasons in villages

Morkhana, Husansar, Jaimalsar, Gigasar, Kesar-Desar, Boran and Gadwala of Bikaner district. The ethno-veterinary practices for management of skin infections used by the camel farmers were also recorded and will be scientifically validated in future.

The genes such as RNA binding protein (RBP) gene, Uracil DNA glycosylase (UDG), IL-10 and GM-CSF inhibitor and virion core protein (VCP) of pseudocowpox virus isolates from Indian dromedary camels were sequenced and submitted to the NCBI database. Further, genes such as 6L, 201R, 11R and Toll-like receptor inhibitor of camel pox virus were amplified by PCR, cloned, sequenced and submitted to the NCBI database. Cytokine gene IL-10 of the dromedary camel was amplified from Con–A stimulated peripheral blood mononuclear cells. Simultaneously, sub cloning of the dromedary camel IL-2 gene in pPIC-Z alpha (a) vector was achieved successfully. Electroporation of the same into GS115 yeast cells was also carried out successfully. The Toll Like Receptor (TLR-2) was amplified and cloned into pGEM-T vector successfully and submitted for sequencing.

Calreticulin (CRT) gene of camel tick was successfully amplified, cloned and sequenced. In phylogenetic tree, the CRT gene of camel tick (*Hyalomma dromedarii*) was found to be closely related with *Hyalomma excavatum* and distantly with *Dermacenter andersoni* and *Hyalomma qinghaiensis.* The percentage of identity of nucleotide sequence of Calreticulin gene of *H. dromedarii* with other different species of hard ticks shows 97% identity to *Hyalomma excavatum* and 90% identity to the genus *Dermacenter*.

The presence of antibodies in the camel serum against hTg was confirmed. The cDNA template was used to amplify the region between VhH and CH2 domain of camel immunoglobulin using primers CH2FORTA4 and VHBACKA6. The 600bp band which is devoid of coding sequence for CH1 domain and corresponding to heavy- chain antibodies were used as template for further amplifying the VhH portion of the immunoglobulin using nested PCR. The nested PCR yielded amplicons of 450 to 520 bp, which corresponds to the coding sequence of VhH. These amplicons will be further used for the production of recombinant VhH antibodies. Apart from this, Tg-IRMA assay is set up using the polyclonal Tg antiserum raised in camel.

It was found that the supplementary feeding of even 2 Kg of complete feed pellets of 10% CP and 62% TDN prepared from dry fodder 50%, Bajra grain 20%, Guar Korma 8%, Rice polish 2.5%, De-oiled rice bran 12.5%, Molasses 5%, Area specific mineral mixture 1% and Salt 1% along with grazing during last 3 months of gestation was sufficient for optimum calving performance.

Supplementary feeding by complete feed pellets to calves reared under silvi-pasture system having the components of grass- *C. ciliaris and Panicum antidotale,* along with trees *Z. numularia, P. cineraria, A. tortilis, Salvadora oleidus and Murali kankani*. The biomass yield from the grass components of silvi-pasture areas for 2 months period indicated that the grasses alone can meet the maintenance requirement of camel calves. However the supplementary feeding (1kg complete feed pellets-10 % CP and 62% TDN) was found to have beneficial effect on growth of calves.

The performance study of camel calves fed *ad lib* complete feed pellets prepared using feeds available locally having 50:50 proportion of roughage and concentrate and containing 9.80% CP (Gr-1), 12.91 % CP (group Gr-2) and 15.82 % CP (Gr-3) with regard to growth, feed intake, feed conversion efficiency and cost of feeding indicated that calves fed on Gr-1diet had better gain and better feed conversion efficiency.

Twelve cellulolytic bacterial isolates from rumen microbes were used for molecular characterization and DNA was isolated by manual method. The DNA yield was of high purity between

1.8-2.0 and DNA ratio at 260/280 nm was recorded after 24 hour and 48 hours. The DNA samples were amplified on PCR using universal primers, PCR purification was done using kit method and samples were sent for gene sequence and similarity pattern were seen to be 99%.

Genomic DNA from rumen fluid was extracted and the DNA purity and concentration was analyzed by spectrophotometric quantification and gel electrophoresis. Pyrosequencing and Sequence Analysis using 454 Life Sciences technology based high throughput sequencer (GS FLX Roche) were done at Anand Agricultural University, Gujarat. The read data was analyzed using Metagenomics RAST server 3.0. The Bacteroidetes (> 50%) were revealed to be the major phyla followed by Firmicutes and then Proteobacteria with varying percentage. The other phyla showed < 2 percent of hits.

The camel feeds and fodders viz., 4 fodder samples (Bajra kadbi, Barley straw, Guar phlagati, Groundnut haulms) and 3 feed pellets having 3 protein levels were evaluated in *in-vitro* studies using camel rumen liquor. Total gas production was higher in feed pellets than on roughages and percent methane was quite variable. Trend of different VFAs indicated that acetate production was higher, followed by propionate and butyrate in all roughages and feed pellets. The yield of all the VFAs viz., acetate, propionate, butyrate iso-valerate and n-valerate were lower in case of barley straw, bajra kadbi and guar phalgati than feed feeds. The yield of other VFA of iso-butyrate was not much different among roughages and feed pellets. Lower yield of total VFAs was observed in case of barley and bajra straws. During *in-vitro* fermentation study, the Higher IVDM digestibility, total-N and VFAs were observed in feed pellets as compared to roughages.

The association effect of mixing Khejri (*Prosopis cineraria*) leaves as tanniniferous plant with Moth (*Phaseolus acontifolius*) chara as basic diet of camel feed was studied. The feeding cost of Khejri leaves mix was higher compared to that feeding Moth chara. Therefore using Moth chara as good feed for camels and could be nutritional and economically better than Khejri leaves especially in terms of energy and protein.

The climate adaptability was studied with 9 male camels kept under asbestos roofed shed and fed under stall feeding conditions with watering once a day. Thermo-adaptive behavioral parameters were recorded at fortnight interval while some climatic parameters were also recorded at morning and evening time period. The Iberia Heat Tolerance Coefficient (IHTC) and Benezara Coefficient of adaptability (BCA) were worked out for all camels in three climatic conditions. BCA was significantly ($P < 0.01$) higher during evening as compared to morning.

During the year 2011-12 the area of 65.5 ha was utilized for sowing fodder crops and total green fodder and seed production from various crops grown was 1130.55 q and 95.69 q respectively. The fodder crops grown during the Kharif season were Bajra, Moth, Guar, Jowar and grasses like *C. ciliaris*, *L.sindicus* and *P. antidotale*. Dry fodders of guar and bajra were also produced to the tune of 179.6 and 58.00 q respectively. Guar seed production (75.43 q) realized Rs. 7,16,585/- during this year. Silvi-pasture areas of 9.75 ha of Dhaman (*C. ciliaris*) and Grammna (*P. antidotale*) were utilized by camels under grazing study from August to October, 2011. This year, 600 and 127 saplings of of Neem, Khejri and other plants were planted respectively with survivability of more than 80%. During the monsoon season all camels from June to October, 2011 were shifted to rangeland areas of the Centre which saved the intensive feeding of 3092 q fodder and concentrates. This year 683 q pelleted complete and concentrate feed was produced by utilizing conventional and unconventional feeds and fodders for feeding general and experimental animals. Under TSP programme 86 q pellets and 100 kg area specific mineral mixture were distributed

the tribal people engaged in livestock husbandry in the districts of Dungarpur and Banswada.

Five exhibitions and five milk competitions of camel among farmer/commodity interest group were organized at different locations in rural and urban areas. One camel fair was organized at the Centre and various activities like milking, racing, film show, saddlery decoration, riding, carting, dance were conducted to promote camel rearing.

Under the Tribal sub plan a team of experts consisting of scientists and senior technical officer visited the villages Pachlasa Bada, Ghatada, Barwasa Maafi, Barwasa Jagir, Garhi and Umrai (Tripur Sundari), Oda, Aspur, Sundanpur and Talwara in Banswara and Dungarpur districts and interacted with the farmers, local veterinary officers and the village Panchayat personnel for providing the technical know-how and Animal Husbandry related information. In order to meet the requirement of tribal population engaged mostly in the agriculture and animal husbandry related activities, the activities of Kisan Goshthis, practical trainings, demonstrations, animal health and animal judging camps were held in the villages Jolana in Banswara district and Dhani Khajoor, Taluka Aspur, district Dungarpur. Experts of agriculture, animal husbandry and horticulture from NRC on Camel, Bikaner; CAZRI, Jodhpur; CIAH, Godhra; Anand Agricultural University, Anand and State Animal Husbandry department officials from Banswara and Dungarpur participated in these camps and farmers were apprised of latest development in the areas of livestock management, nutritional care, processing and preparation of camel & goat milk products, technologies of urea treatment of feed & fodder and importance of mineral mixture, reproduction and health care.

2. Introduction

Brief History

The Project Directorate on Camel, Bikaner came into existence on July 5, 1984. The physical facilities and animals (149 camels of Bikaneri breed and around 824 ha land) were transferred by Government of Rajasthan. Later on it was upgraded to National Research Centre on Camel on September 20, 1995, under Indian Council of Agricultural Research.

Location

The Centre is located in the Jorbeer area of Bikaner city. It is situated at Latitude: 28° 01' North and Longitude: 73° 11' East with Timezone: GMT +05:30 hours. The soil type is loose and sandy. The climate is mostly dry and hot with annual rainfall in the range of 260-440 mm. The temperature ranges between 30-48^{0}C in summer and between 4 to 28^{0}C in winter season.

Mandate

The centre was established with the mandate of conservation and preservation of existing breeds of camel and to generate baseline research data on camel. The mandate was revised from time to time taking into consideration the achievements done by the scientists of the centre and development in the field across the globe. The existing mandate is:

- To undertake basic and applied research for improvement of camel
- To provide leadership and co-ordinate camel research and training nationally and act as a national repository of information and
- To collaborate with national and international agencies for camel research and development.

The work of the centre is being carried out in the areas concerned as in camel breeding and genetics, camel physiology, camel biochemistry, camel reproduction, camel health, camel nutrition, camel management and extension, camel products technology, camel farming and agro-forestry and AKMU and PME cell.

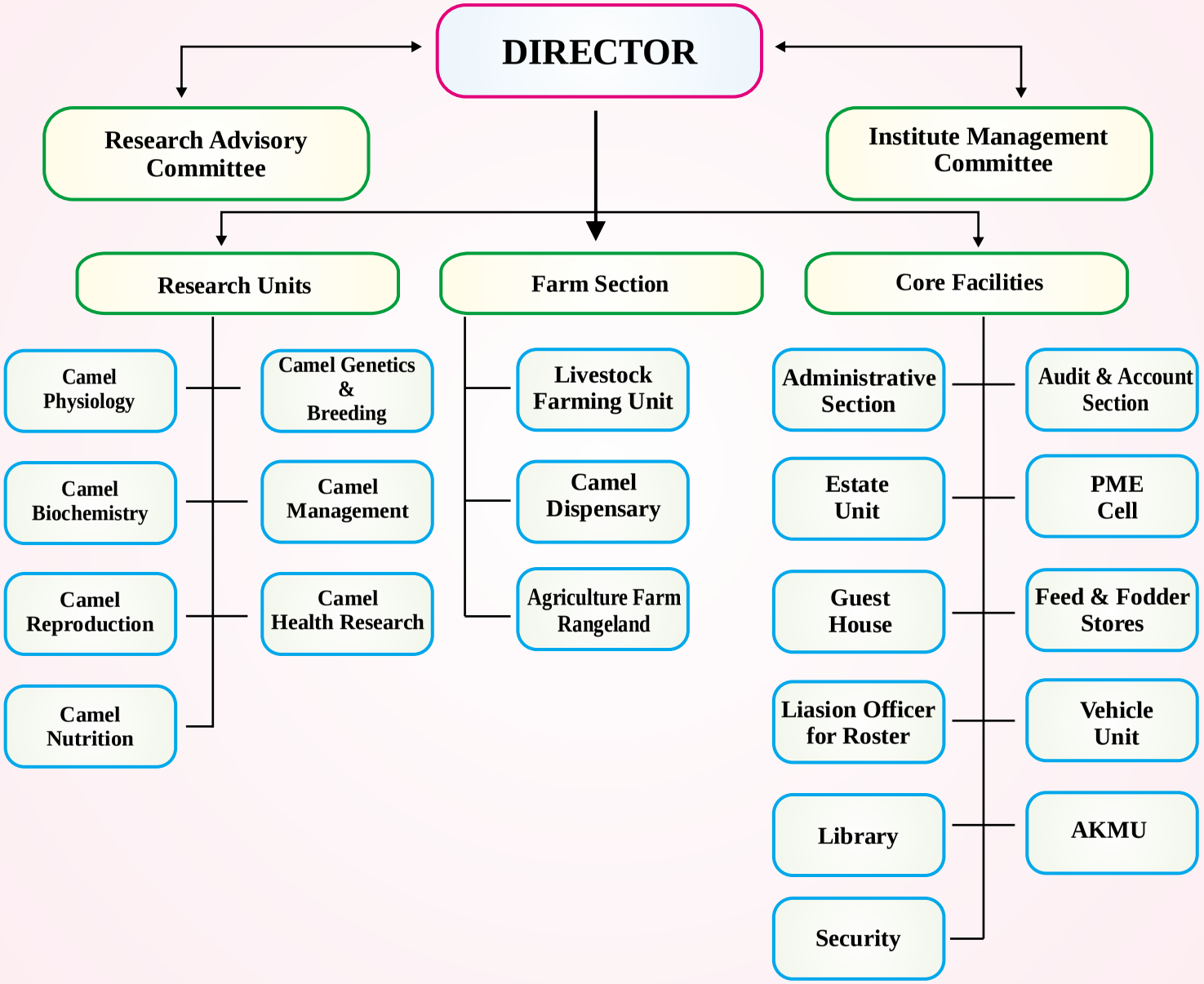
Infrastructure

Over the years, NRCC has developed excellent infrastructure facilities including modern laboratories, library, visitor's room, museum and a feed plant.

The NRCC has modern laboratories situated in three complexes. The laboratories are fully equipped to handle modern research in the field of camel physiology, reproduction, biochemistry, genetics and breeding, biotechnology, health, nutrition, camel management and milk products technology.

The camel farm maintains an elite herd of about 383 camels comprising of Bikaneri, Jaisalmeri, Kachchhi and Mewari breeds. An area of about 650 ha of farm land has been fenced and 45 ha of land have been brought under perennial

Organization Setup



silvi-pasture comprising of grasses, shrubs and trees. The library subscribes to about 15 Indian and 13 foreign journals and has collection of 7882 reference books.

The center is recognized as one of the important tourist place of India. The camel museum of the centre depicts historical, cultural, social, economical and scientific aspects of camel and attracts the attention of national and international researchers and tourists. The camel milk parlour at the centre serves different value added camel milk products like flavoured milk, pasteurized milk, lassi, kulfee, tea and coffee to tourists and visitors which are available as a part of ongoing research activity.

Staff position (as on March 31, 2012)

Cadre	Number of post sanctioned	Number of pots filled
Director	1	1
Scientific	23	18
Technical	24	24
Administrative	12	9
Skilled Supporting Staff	18	18
Total	**78**	**70**

Financial statement (2011-12)

The optimal utilization of funds allocated to the Centre was ensured during the year and actual utilization of the budget under plan and non plan head was as under during the year 2011-12,

Financial statement and revenue receipt (2011-12)

(Rs. In Lakh)

Head of Account	Plan		Non Plan	
	Budget	Expenditure	Budget	Expenditure
Pay & allowances	-		422.25	422.19
Wages	-		30.15	30.15
T. A.	3.00	3.00	1.50	1.50
O.T.A.	-	-	0.15	0.15
H. R. D.	3.00	2.95	-	-
Other charges including Equipments	194.71	194.71	92.56	92.56
Works	105.01	105.01	-	-
Total	**305.72**	**305.67**	**546.61**	**546.55**
Revenue generated: 39.97				

Financial statement (2011-12) of external funded projects (Rs in Lakhs)

Sl.No.	Head	Sanctioned Budget	Expenditure
AICRP			
1	TA	0.42	0.41
2	Contingencies	10.00	9.01
	Total	10.42	9.42
VTC			
1	TA	0.45	0.40
2	Recurring Contingencies	3.00	2.90
	Total	3.45	3.30
IPR			
1	Contractual Staff Cost	4.70	4.56
2	Library Book and Journals	0.47	0.47
	Total	5.17	5.03
NAIP			
1	TA	0.75	0.41
2	Contractual Service	4.14	4.10
3	Operational Costs	10.50	9.07
4	Institutional Charges	0.71	0.22
	Total	**16.10**	**13.81**

3. Research Achievements

Camel Genetics and Breeding

Genetic evaluation of performance

On 1st April 2011 the herd strength of camels at the centre was 365. During the year 2011-12, 49 calves were born and 3 camels of Bikaneri breed were purchased, 20 camels were auctioned and 14 camels died, and closing balance of camels on 31st March 2012 was 383 (Fig. 1).

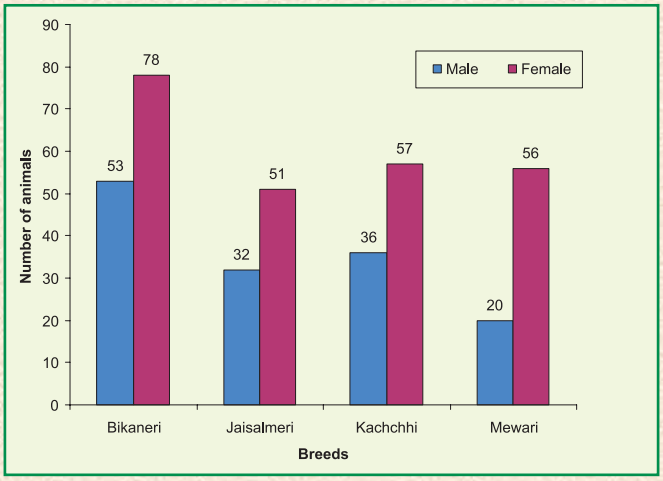


Fig. 1 Breed wise and sex wise herd strength

Growth Performance: Data for growth performance i.e. body weight at birth to 48 months were analyzed. The year wise growth in terms of body weight is presented in table-1. The effect of the year was found highly significant ($p<0.01$) from birth to 36 months of age group. The effect of sex was found highly significant ($p<0.01$) at the age of 48 months whereas effect of breed was found non-significant in all the age groups.

Reproductive performance: This year the conception rate was 63% wherein out of total 73 services given to the females 46 were conceived. Thirty six calves were born out of the regular breeding of the herd and eight calves were born in reproduction project. Thirteen females aborted and out of them seven were positive for trypanosomiasis. Comparison for age at first service and age at first calving are also presented in table-2.

Mortality: The mortality of 14 camels has occurred during this year which is 3.77% and breed, age group and sex wise mortality are presented in table-3.

Table 1- Growth performance of the herd (kg)

Years	Birth	1 year	2 year	3 year	4 year	≥ 5 year
2011-12						
2011-12	36.24±0.8 (33)	253.48±5.6 (47)	341.36±8.4 (33)	466.47±11.6 (34)	536.50±18.8 (28)	577.56±6.6 (157)
2007-11						
2007-08	41.03±0.9 (29)	291.03±8.5 (26)	385.78±6.2 (28)	454.14±7.5 (14)	508.86±14.3 (23)	603.76±6.9 (126)
2008-09	40.52±0.7 (53)	317.37±7.6 (24)	398.17±9.5 (23)	475.87±13.3 (24)	515.10±18.5 (19)	603.83±8.0 (141)
2009-10	36.90±0.7 (33)	315.29±7.3 (47)	419.73±13.2 (30)	448.73±12.2 (34)	544.20±13.5 (25)	593.23±6.8 (173)
2010-11	34.71±0.7 (53)	270.78±6.2 (28)	367.58±9.6 (34)	477.20±14.9 (34)	507.84±13.8 (32)	570.66±6.1 (175)

Table-2 Reproductive performance (Mean±SE)

Year	Age at 1st Service (days)	Age at 1st Calving (days)	Conception rate of herd
2011-12	1754.0	2185.0±55.24	63.01%
2007-11			
2007-08	1839.8±34.98	-	76.56
2008-09	1863.33±37.28	2250.33±56.98	64.58%
2009-10	1863.0±44.13	2255.0±51.88	92.21%
2010-11	1679.52±49.11	2251.33±52.43	76.38%

Table-3 Breed, sex and age group wise mortality

Breed	Sex		Age group (year)			Pooled
	M	F	0-1	1-4	> 4	
Bikaneri	3	2	1	-	4	5
Jaisalmeri	2	4	-	3	3	6
Kachchhi	-	-	-	-	-	-
Mewari	1	2	2	-	1	3
Total	6	8	3	3	8	14

Breeding Plan: The criterion of selection of male camels for breeding plan was body length and the independent culling levels were fixed for heart girth and height at wither. The biometry was done of 41 camels during September 2011. Out of which 16 camels in different breeds with best records of biometry were selected for farm breeding and 5 Bikaneri camels were selected for providing service to the she camels of villagers (table-4). The natural service by farm studs was provided to 105 she camels of the nearby villages. Efforts were made to follow up the progress of the last year for she camels conceived by the camels of the farm. The percent conception and calving was about 50%.

Table- 4 Body parameters (Mean±SE) in male camels selected for breeding (cm)

Breed	N	Body length	Heart Girth	Height at wither
Overall	16	165.62±1.51	222.9±2.5	211.6±1.4
Bikaneri	5	169.2±3.2	228.4±6.37	213.4±2.3
Jaisalmeri	3	165.3±2.72	225.3±1.66	213.3±1.4
Kachchhi	5	163.6±2.83	221.0±3.13	212.2±2.7
Mewari	3	163.3±2.4	214.6±3.93	205.0±1.4

Databases: The following databases of Centre were maintained and updated regularly

1. Inventory of camel herd.
2. Database for growth of camel herd.
3. Reproduction database.
4. Database on biometry for selection of studs.
5. Health database.

Milk production potential

The recording commenced from day 15th after calving. Three times milking was followed till the calf attained an age of 3 months. Two teats (one front and one rear) were milked and the other two were left for the calf to suckle.

During the year 2011-12, the average daily milk production was 2474.63±9.86 ml with 2338.54±16.50 ml in Bikaneri, 2590.17±19.25 ml in Kachchhi and 2495.18±15.23 ml in Mewari. The effect of breed was highly significant (P<0.01). The milk production was higher in morning as compared to the evening. The production from rear teat was higher as compared to the front teat (Table 5). The highest production was in 4th lactation (2695 ml) followed by 3rd (2569 ml), 2nd (2247 ml) and 1st (2010 ml). The production in different months varied significantly (P<0.01) (Table 6).

To carry out the pooled analysis for the year 2008-09 to 2011-12, the parities for the purchased animals were revisited and necessary corrections were done. The multivariate analysis showed significant effect of breed, lactation, year and their all possible interactions. The overall average per day milk production was 2841±47 ml with

2702±54 ml in Bikaneri, 3101±97 in Kachchhi and 2597±77 ml in Mewari breed. The effect of breed was highly significant with highest production in Kachchhi breed. The average daily production was 2488±72, 2771±107, 3170±70 and 2943±98 ml respectively in 1st, 2nd, 3rd and 4th parity. The effect of parity was also highly significant with highest production in 3rd parity. Similarly the figures for the year 2008, 2009, 2010 and 2011 were 3585±87, 2795±74, 2935±68 and 2349±126 ml respectively. The effect of year was also highly significant with highest production in the year 2008. All possible interactions of breed, parity and year were also highly significant. The significance clearly suggested that the non-genetic factor year influenced the data to a great extent due to which the interpretation about the breed and parity were also influenced (Table 7).

Table 5 : Daily milk production (ml) of dromedary breeds (Mean±SE)

Breed	Morning		Evening		Total
	Front	Rear	Front	Rear	
Pooled	624±3 (7571)	747±3 (7571)	458±2 (7571)	575±3 (7571)	2475±10 (7571)
Breed	**	**	**	**	**
Bikaneri	589±5 (2604)	707±5 (2604)	428±4 (2604)	544 ±4 (2604)	2339±17 (2604)
Kachchhi	657±6 (1913)	787±6 (1913)	479±5 (1913)	591±5 (1913)	2590±19 (1913)
Mewari	625±4 (3054)	748±5 (3054)	468±4 (3054)	588±4 (3054)	2495±15 (3054)

Table 6: Daily milk production (ml) in different months of lactation(Mean±SE)

Month	Lactations			
	1st	2nd	3rd	4th
Over all	**2010±22 (1201)**	**2247±17 (2281)**	**2569±32 (3305)**	**2695±25 (784)**
Month	**	**	**	**
1	1385±76 (59)	1258±56 (119)	2008±62 (202)	2545±95 (48)
2	1464±76 (59)	1933±46 (174)	1965±56 (247)	2331±87 (57)
3	1634±62 (87)	1967±46 (177)	2657±54 (265)	2660±86 (59)
4	1875±62 (89)	2215±46 (179)	2831±54 (267)	2907±85 (60)
5	1983 ±62 (89)	2484±46 (177)	2692±55 (253)	3077±85 (60)
6	2346±61 (90)	2850±48 (162)	3002±54 (263)	3300±86 (59)
7	2495±62 (88)	2837±46 (176)	3115±54 (267)	2784±87 (58)
8	2492±61 (90)	2587±46 (174)	2941±54 (266)	2828±85 (60)
9	2389±62 (87)	2512±46 (178)	2838±54 (263)	2710±86(59)
10	2218±62 (88)	2449±46 (179)	2695±54 (264)	2634±86 (59)
11	2246±63 (84)	2303±46 (177)	2630±56 (250)	2562±86 (59)
12	2133 ±64 (82)	2302±47 (172)	2616±64 (191)	2559±86 (59)
13	2111±62 (88)	2094±50 (149)	2619±73 (144)	2444±11 (34)
14	2070±70 (68)	1619±71 (75)	2396±83 (113)	2522±12 (30)
15	1783±85 (47)	2292±17 (13)	2128±13 (46)	2565±13 (23)
16	1533±23 (6)		1975±44 (4)	

Table 7 : Daily milk production (ml) of dromedary breeds in different parities during 2008-11 (Mean±SE)

Parameter	Morning		Evening		Total
	Front	Rear	Front	Rear	
Pooled	735±13	873±14	491±10	615±11	2841±47
Breed					
Bikaneri	699±15	834±16	463±11	586±12	2702±54
Kachchhi	807±26	956±28	533±20	661±22	3101±97
Mewari	662±21	787±22	461±16	579±18	2597±77
Parity					
1	645±20	782±21	416±15	534±16	2488±72
2	713±29	849±31	482±22	604±25	2771±107
3	830±19	970±20	552±15	681±16	3170±70
4	754±27	895±28	512±20	643±22	2943±98
Year					
2008	905±24	1106±25	611±18	760±20	3585±87
2009	731±20	859±22	473±15	602±17	2795±74
2010	779±19	906±20	495±14	614±16	2935±68
2011	590±34	715±37	433±26	547±29	2349±12

Structural analysis of 5' flanking region of dromedary milk protein gene (s)

After knowing relevant sequences, the primers were designed using online software of NCBI. Six promoters or corresponding exonic regions, viz. α_{s2} casein, β-casein 1, β casein 2, lactophorin, α-lactalbumin, peptidoglycan recognition protein were successfully amplified in the dromedary. The amplified fragments were characterized by RFLP using suitable restriction enzyme as short listed by Gene Tool software. The amplicons were eluted using EZNA gel extraction kit of Omega Bio-Tek, USA. The eluted products were cloned and full length sequencing was carried out. Uniqueness of the sequences were established by online software. Further analysis of the sequence was carried out for α-lactalbumin and β-casein1. The dendrograms were constructed and the sequences were submitted to TESS online software of University of Pennsylvania for localization of transcriptional elements. The results are presented in Table 8.

Camel Physiology

Adaptability of camel with different body condition scores (BCS)

The body condition scores in camels of different physiological stages like new born, growing (1-2 yr), adult (3-6 yr) and aged (>6 yrs) were recorded on the basis of five point scale. Study of physiological responses like Pulse rate (PR), Respiratory rate (RR) and Body temperature (T) recorded as per BCS indicated that Pulse rate (PR) in males was higher than females except for animals of BCS 3.5. Similarly, Respiratory Rate (RR) was more in females than male except in males of BCS 3.5, Body temperature (T) was higher in case of male but for 4.5 BCS females (Fig 2-4). Biochemical analysis and comparison of all the four breeds in relation to BCS done revealed that haemoglobin was slightly higher in animals having 4 BCS but it was not significantly different and TEC was also similar in all animals. PCV,

MCV, MCH and MCHC showed no significant variation and deviation from normal in all BCS animals (Table 9). In the milch animals, milk constituents (fat, protein, SNF, lactose and ash) analyzed did not differ much in values except for fat in case of higher BCS animal (Table 10).

Table 8: Analysis of α-lactalbumin and β-casein1 promoter

Name	Transcriptional Elements	α-lactalbumin		β-casein1	
		Motif	No.	Motif	No.
TATA box	TATA box	TATA[AT]A[AT]	-	TATA[AT]A[AT]	1
CAAT box	CAAT box	CAAAAT	1	CAAAAT	1
Oct 1 Oct 4	Octamer protein 1	ATGGAAGG ATTTTTAT	1 1	ATACAATT	1
Runx2	Runx2 protein	TGTGGT	-	ACCACA ACCACA	-- -
MAF	Mammary cell activation factor	ACATCC	1	GGCAGT	1
IRE	Insulin responsive element	TCACTT	1	AAAGAGAAAG TCACTT	1 1
GR half	Glucocorticoid responsive element	TGTGAT GGGACA	2 1	ACAACA TGTTGT TCTTCT TGTGCC	4 4 2 2
PRLE	Prolactin responsive element	CTGATTA	-	CTGATTA	1
MGF/ STAT5	Mammary gland specific factor/ Signal transducer and activator of transcription 5	TTCNNNGAA TTCTGGAA	3 3	TTCNNNGAA TTCTGGAA	4 2
YY1	Yin Yang 1 factor	WNNNAANAWGG CCWTNTTNNNW GTGTCCAGTA CCATAT TGT CTCCATTTCAGGAT AAGGAAAAATGGGGTGA	3 9 1 1 2 1	CCWTNTTNNNW GCATCCATA CCATAT CCATGT ATATGG	6 1 1 1 1
C/EBP	CCAAT/ enhancer binding protein	CWWWCCAC	2	GATTGTGCAAT	2

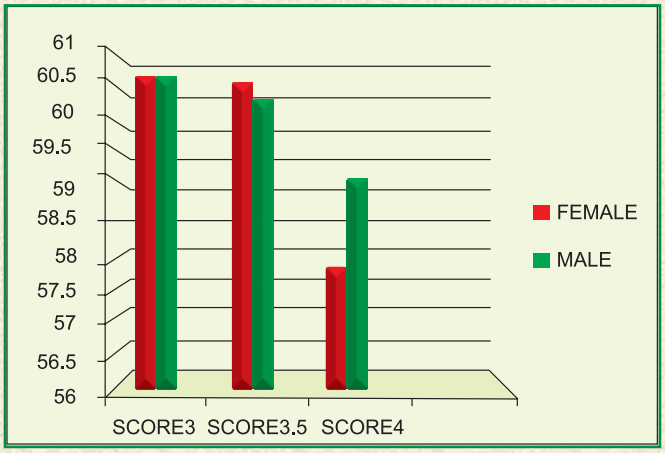


Fig 2- Pulse rate(/ min) of camels in different BCS.

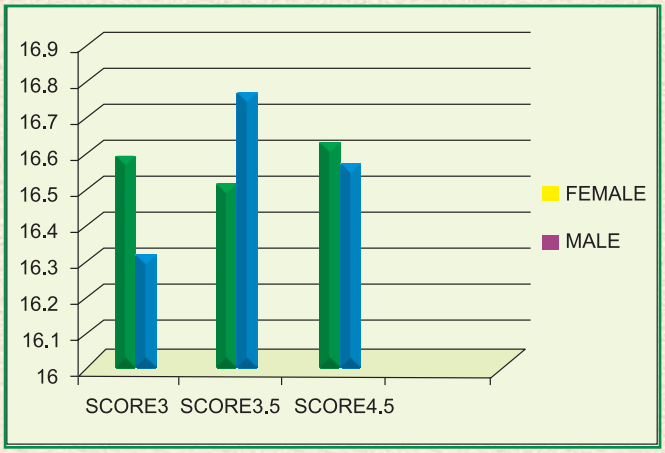


Fig 3- Respiration rate (/min) of camels in different BCS

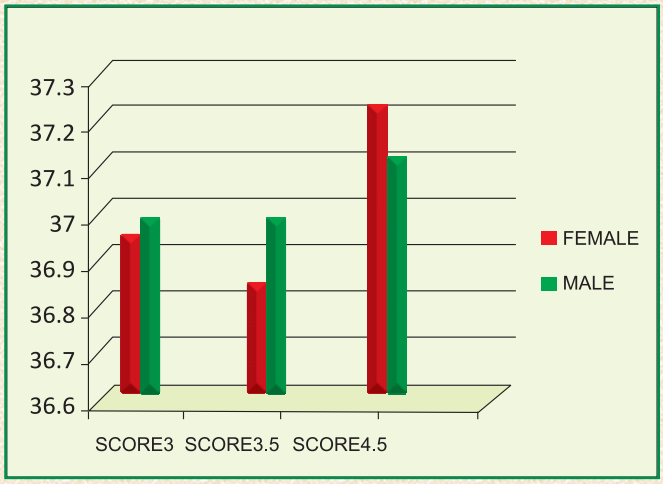


Fig. 4- Temperature (^{0}C) of camels in different Body BCS.

Table: 9 Biochemical and haematological parameters (Mean±SE) in camels of different BCS

Parameters \ Score	2.5	3	3.5	4
Glucose(mg/dl)	-	109.86±11.05	94.60±4.68	101.65±3.03
T.G. (mg/dl)	62.30±10.91	38.35±4.37	40.71±3.86	35.49±3.17
Urea (mgdl)	25.85±3.83	28.78±3.88	24.94±2.17	23.28±2.40
P (mg/dl)	10.49±0.65	9.65±0.89	8.80±0.68	8.49±0.95
Mg (mg/dl)	2.79±0.10	2.65±0.35	3.02±0.27	2.90±0.43
Creatinine (mg/dl)	1.89±0.12	1.85±0.09	1.81±0.08	1.58±0.13
Ca (mg/dl)	-	5.59±0.80	8.12±1.43	-
Cholesterol (mg/dl)	37.29±5.03	39.19±1.99	39.96±3.92	33.16±2.10
GOT (U/L)	93.13±6.40	91.19±4.78	82.91±4.13	82.68±5.92
GPT (U/L)	11.76±0.82	9.56±0.84	9.25±0.75	8.71±0.70
Albumin (g/dl)	3.50±0.23	3.52±2.56	2.84±0.94	2.94±0.05
Hb (g/dl)	13.06±0.84	12.92±0.44	12.81±0.3	13.43±0.28
PCV(%)	40.66±2.84	40.62±2.11	39.69±1.08	40.9±1.13
TLC(10^3/cum)	7.93±0.95	10.88±1.01	10.42±0.65	11.09±0.61
MCV(fl)	48.1±0.94	47.93±1.35	46.02±0.53	46.33±0.62
MCH (pg)	15.48±0.43	15.37±0.24	15.03±0.12	15.11±0.22
MCHC (g/dl)	32.15±0.27	32.04±0.74	32.77±0.38	32.91±0.34

Table 10- Milk composition (Mean±SE) of Camels having different BCS

BCS	3.5-4.5	2.5-3.5
No of animals/ observations	17/989	3/173
Fat	2.53±0.02	2.38±0.05
SNF	6.75±0.02	6.72±0.03
Protein	2.17±0.01	2.15±0.01
Lactose	3.78±0.01	3.78±0.02
Ash	0.78±0.00	0.78±0.00
TS	9.28±0.03	9.10±0.07
Water	90.72±0.03	90.90±0.07

Bio-prospecting of genes and allele mining for abiotic stress tolerance (NAIP)

Physiological (rectal temperature, pulse rate and respiration rate) and haematological (RBC count, WBC count, haemoglobin %, MCV, MCH and MCHC) parameters of dromedaries (n=50) during extreme summer and winter months of the year were estimated. The mean values of these parameters are given in the Table 11. Amplification and cloning of HSP70 A1A and HSP 70A1B genes of the dromedary camel were successfully carried out from peripheral blood mononuclear cells and submitted for sequencing.

Camel Reproduction

Sexual and bio-stimulation in camel reproduction Effect of Bio-stimulation on male during non-breeding season

In the study conducted during 3 periods of non-breeding season from June to August, 2011, in first period of 30th June to 10th July, 10 male camels were allowed no contact with female camels, in second period during 26th July to 2nd August, the male camels were tied outside the corral where females were kept and in the third period during 3rd to 10th

Table 11. Physiological and haematological parameters in camel (Mean±SE)

Season	Summer	Winter
Temp (^{0}F)		
M	100.2	95.9
E	103.2	97.9
Pulse (beats /minute)		
M	60.6	50.6
E	63.7	54.7
Respirations (breaths/min)		
M	18.0	19.8
E	18.2	19.0
WBC (10^3/µl)		
M	17.9	20.7
E	18.2	20.3
RBC (10^6/ µl)		
M	8.5	8.8
E	8.6	9.6
Hb (g/dl)		
M	10.1	13.0
E	10.1	11.5
MCV(fl)		
M	33.4	31.6
E	33.3	31.7
MCH (pg)		
M	11.7	13.3
E	11.7	13.1
MCHC (g/dl)		
M	35.3	41.3
E	35.3	40.9

(M: Morning; E:Evening)

August, the males were paraded inside the camel corral where adult female camels were loosely held. Initially and at the end of first period no male camel showed any symptoms of rut. Whereas at the end of third period two male camels (K 162 and J 276) showed full signs of rut whereas another two male camels showed mild symptoms of rut. This shows that bio-stimulation has positive effect on reproductive behaviors in male camels during the peak non-breeding season.

Behaviour response of female to Androst-16-en-3-ol and Androst-16-en-3-one

Use of Androst-16-en-3-ol and Androst-16-en-3-one, the compounds having known pheromonal properties in other species and also isolated in poll gland secretion of dromedary, did not invoke any significant response in female camels when used individually (Fig. 5). However in combination in certain proportion they might have pheromonal effect in dromedary.

Fig. 5. Behaviour response test of she camels

Artificial Insemination

For the A.I. experiment, six she camels were examined and selected. Two protocols employing (i) Inj. Pubergen (hCG) HP 5000 IM and (ii) Inj. Suprefact 0.020 mg epidurally were used for induction of ovulation. The time of insemination was fixed for each female at 27-28 h after administration of ovulating agent and second insemination after 24 h of the first insemination. The insemination was performed using extended semen having Tris egg yolk citrate as extender. One out of six females (B601) is tentatively diagnosed as pregnant. The experiment is in progress and repeated insemination will be attempted. One she camel (J 129) conceived by AI last year has calved successfully.

Relation between follicle size and natural mating

Five adult she camels- non-pregnant in last breeding season were taken for the study. Ultrasound examination was performed for knowing the ovarian status. A camel stud was left inside the camel corral for whole day continuously for a week period with female camels.

Table12: Response of male to females having follicle of varied diameter.

Camel	Ovarian status (follicle)	Mounting response
M 25	Two 13 & 11 mm	on day 1
M 67	Small 6-7 mm	on day 5
M 61	Three big 3-5 cm	Not mounted
M 37	One large 5 cm	Not mounted
M 77	Very small 5 mm	on day 4

The results (Table12) showed that male camel has ability to select female camels with appropriate follicle size for mating. The existence of pheromonal and/or audio-visual communication alone or in combination may be responsible for this natural selection.

Animal Biochemistry

Value added camel milk products

Rasogolla

The use of pure camel milk for the preparation of chhana revealed that coagulated mass was loosely bound. Chhana balls made from the pure camel milk developed cracks and could not be boiled in sugar syrup due to loose binding. Therefore different ratios of camel, cow and buffalo milk were used for the preparation of rosogolla. By using camel and cow milk mixed in different proportions (4:1, 3:1, 2:1, 1.5:1), the coagulum still remained loosely bound and chhana balls could not be boiled. But, an increase in the yield of coagulated product was observed i.e. 9.5-10.0% with camel+cow milk versus 8.5-9.0% with whole camel milk alone.

Further, camel milk+cow milk in 1:1 ratios showed good binding along with increase in the yield of chhana up to 10.3-10.5%.

When camel and buffalo milk were used in different proportions (4:1, 3:1, 2:1); chhana was found to be loosely bound. Camel and buffalo milk in the proportion of 1.5:1 and 1:1 showed effective increase in binding with a recovery of 12-13% (Table 13).

Sensory evaluation carried out for the rosogolla prepared from camel milk+cow milk; T1 (1:1), camel milk+buffalo milk; T2 (1.5:1) and camel milk+buffalo milk; T3 (1:1), as these combinations gave good binding of the coagulated product is shown in table 14.

Overall acceptability scores were significantly higher ($P<0.05$) for T2 and T3 compared to T1. Highest scores for smell, body and texture, taste and overall acceptability were observed for the rosogolla prepared by using camel milk+buffalo milk in 1:1 ratio (T3; Table 14). The moisture and fat contents of the rosogolla were 28.7-41.1% and 3.3-6.5% respectively (Table 16).

Table 13. Texture and recovery of chhana in various milk combinations

Source	Texture (binding)	Recovery
Whole Camel milk	Loose	8.5-9%
Camel milk+ Cow milk (4:1, 3:1, 2:1, 1.5:1)	Loose	9.5-10.0%
Camel milk+ Cow milk (1:1)	Good	10.3-10.5%
Camel milk+ Buffalo milk (4:1, 3:1, 2:1)	Loose	10.6-11.5%
Camel milk+ Buffalo milk (1.5:1, 1:1)	Good	12.0-13.0%

Table 14. Sensory scores of rosogolla (Mean±SE)

Milk ratios	Smell	Body and texture	Taste	Overall acceptance
Camel + Cow (1:1)	6.85 ±0.22	7.38^{a} ±0.24	5.65^{a} ±0.19	6.63^{a} ±0.16
Camel + Buffalo (1.5:1)	6.92 ±0.21	7.58^{a} ±0.14	6.88^{b} ±0.29	7.13^{b} ±0.13
Camel + Buffalo (1:1)	7.30 ±0.17	8.23^{b} ±0.17	7.00^{b} ±0.11	7.51^{b} ±0.14

($P<0.05$)

Sandesh

Chhana and skim milk powder were mixed in different ratios (19:1; 18:2; 17:3; 16:4 and 15:5 ratios) and cooked on a medium flame with continuous stirring for 3-4 minutes. The mixture was allowed to cool. Thereafter, 32.5% sugar, 5-6 drops of vanilla essence, cardamom powder were added and mixed until smooth dough is formed. The moulds were lightly lubricated with ghee. Little topping mixture of pista+saffron in each mould was placed. Pressed some of the prepared chhana mixture on top of the topping in each mould and shaped. The product was kept overnight for chilling and unmoulded carefully. The sandesh prepared with chhana and skim milk powder in 19:1 and 18:2 was found to melt quickly at room temperature compared to sandesh prepared with chhana and skim milk powder in 17:3; 16:4 and 15:5 ratios (Fig. 6). Overall acceptability of the product was 7.87±0.29 (Table 15). Moisture and fat contents in sandesh were 40-50% and 16-18% respectively.

Fig. 6. Sandesh

Chocolate

Processing technology for the camel milk chocolate was standardized utilizing different levels of chocolate powder and sugar in concentrated milk (Fig. 7).

Fig. 7.Chocolate

Subsequently, camel milk powder, cardamom and saffron were added to it. The ingredients were mixed, heated slightly to melt and then desired shapes were given and kept in refrigeration for solidification. The solidified product was cut into different pieces and wrapped with aluminum foil. Overall acceptability of camel milk chocolate was 8.04±0.49. Moisture and fat contents in chocolate were 5-6% and 8-10% respectively.

Raabri

It is well known that fermented milk products are good for human health. Traditionally some of the cereals are utilized to develop milk products with increased functionality.

Fig. 8. Raabri

In this context attempts were made to utilize Bajra and Moth flour at different levels in fermented camel milk to develop a good quality raabri (Fig. 8). Overall acceptability for Raabri was 7.45±0.46. Moisture and fat contents in Raabri were 80-85% and 2.5-3.5% respectively.

Sweet lassi

Process for production of camel milk sweet lassi was standardized utilizing skim milk powder at different levels to improve its texture and sensory properties (Fig. 9). Camel milk lassi containing 5% skim milk powder, 10% sugar was found to be highly acceptable. Overall acceptability for sweet lassi was 7.27±0.29. Moisture and fat contents in lassi were 82-83.5% and 2.3-2.5% respectively.

Fig. 9. Camel milk Sweet Lassi

Table 15. Sensory scores of different camel milk products (Mean±SE)

Source	Color	Body & texture	Taste	Overall acceptability
Sandesh	8.17 ±0.31	7.67 ±0.42	7.83 ±0.48	7.87 ±0.29
Chocolate	8.16 ±0.54	7.83 ±0.54	8.00 ±0.63	8.04 ±0.49
Rabri	7.60 ±0.45	7.40 ±0.60	7.40 ±0.48	7.45 ±0.46
Sweet lassi	7.80 ±0.23	6.30 ±0.28	7.28 ±0.34	7.27 ±0.29

Frozen Yoghurt with oat flour

Oat grains are well known cereal for its health benefits like as a source of dietary fiber, cholesterol lowering effect, beneficial effects in diabetes etc. Different levels of oat flour were added to camel milk and the textural and sensory qualities of the products were assessed. It was found that the product containing 5% oat flour had good textural as well as sensory properties (Fig. 10). Moisture and fat contents in the product were 67-68% and 4.3-4.6% respectively.

Fig. 10. Frozen Yoghurt with oat flour

Spray Dried Milk Powder

Production parameters for spray dried camel milk powder were standardized (Fig. 11) by Yamato Spray Dryer (Japan). Moisture and fat contents in powder were found to be 3-5% and 9.5-14.1% respectively.

Fig. 11. Spray Dried Milk Powder

Table 16: Chemical composition of various camel milk products

Product name	Moisture (%)	Fat (%)
Rasogolla	28.7-41.1	3.3-6.5
Sandesh	40-50	16-18
Chocolate	5-6	8-10
Rabri	80-85	2.5-3.5
Sweet Lassi	82.0-83.5	2.3-2.5
Frozen Yoghurt with oat flour	67-68	4.3-4.6
Spray Dried Milk Powder	3.0-5.0	9.5-14.1

Functional properties of milk powder

The milk samples were pre-heated to 30-35 ^{0}C before cream separation. Milk was skimmed to desired fat levels using cream separator. For skimmed milk powder production and partially skimmed milk powder production, fat level in milk samples were kept in between 0-0.5% and 0.5-1.5% respectively. The samples were then used for powder production again in three groups- 1) without further heat treatment (raw); 2) heated to 63^{0}C for 30 minutes and immediately cooled to 5^{0}C or below (pasteurized) and 3) heated to 100^{0}C for 2-3 minutes and immediately cooled to 5^{0}C or below (boiled). These samples were utilized for powder production by spray dryer. Different physico-chemical properties of camel milk powder will be studied.

Assessment of commercial viability of camel milk and its value added products

Camel milk and milk products available as products of refinement of technology viz., kulfi, flavored milk, pasteurized milk, tea and coffee prepared and were sold in the Centre's camel milk parlour. Sale from the camel milk and milk products was highest in March 2012 (Fig. 12). Camel milk and milk products were sold for Rs. 3,37,710/- during the year. Considering that the household labor is involved and present minimum cost is considered for the camel milk the estimated net profit could

be Rs.1,71,182/-.The camel milk utilized for preparation of kulfi, flavored milk, pasteurized milk and tea/coffee was 580L, 769L, 964L and 1171L respectively. A total of 5443 L raw camel milk was sold through camel milk parlour. This also includes raw camel milk sold for Rs. 30,600/- to NGO Baba Farid Centre for Special Children, Faridkot and Bhatinda (Punjab).

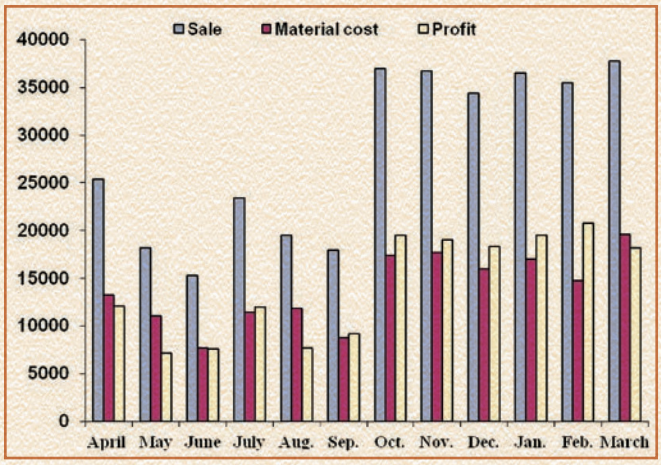


Fig.12. Month-wise sale, material cost and profit from camel milk parlour

Camel Health

Epidemiology of diseases of camel

Parasitic diseases

During the Camel Health Camps organized at Bikaner, Jaisalmer, Udaipur, Jhunjunu, Banswara and Dungarpur different biological samples from camels were collected and cases of Trypanosomosis, Mange, GI nematodiasis, Coccidiosis, Hydatidosis were observed.

A total of 507 samples collected from different districts (Table 17) showing no typical signs of surra were screened by direct blood smear examination and polymerase chain reaction (PCR) using VSG gene primer set for detecting active carrier state of infection in camel. The PCR revealed a product size of 448bp specific for *Trypanosoma evansi*.

Table 17: Prevalence of *T. evansi*

District	N	% positive	
		Blood-smear	PCR
Bikaner	227	15.86	21.14
Jaisalmer	83	18.07	25.30
Udaipur	55	12.73	20.0
Jhunjunu	65	15.38	20.0
Banswara	24	Nil	Nil
Dungarpur	53	5.66	13.21
Total	**507**	**14.0**	**19.72**

Clinical signs such as weakness, lethargy, fever, pale mucosa, nasal and ocular discharges and weight loss were observed in the animals affected with trypanosomiasis. Necropsy findings of the aborted fetus included emaciated, pale and icteric carcasses with spleenomegaly, hepatomegaly, congestion of lungs and enlarged kidney. Further, giemsa stained impression smear (Fig. 13) prepared from all the vital organs – spleen, liver, kidney, lungs and brain revealed the presence of *T. evansi* infection. PCR using ribosomal gene primers confirmed the infection from the fetal organs.

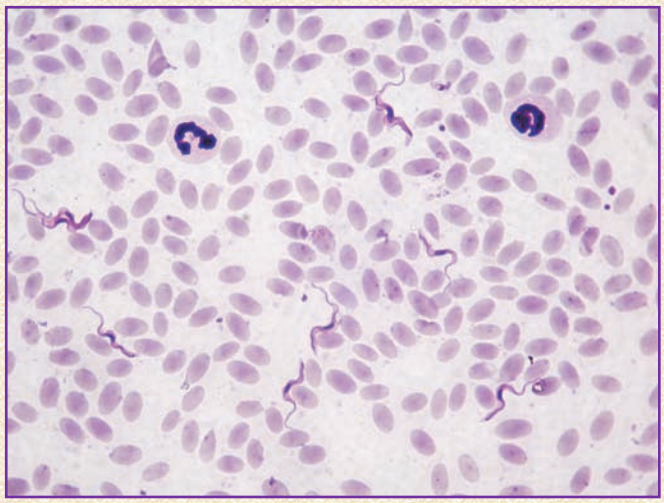


Fig. 13. Blood smear (Giemsa stain) showing *T. evansi*

Molecular characterization of transferrin receptor gene was done to exploit the drug trafficking against *T. evansi* infection. The genes encoded transferrin receptor appeared to be present in

T. evansi. The PCR amplification of transferrin receptor gene revealed a product size of 349bp in camel (Fig. 14). The purified amplicon was further cloned and sequenced. The analysis of sequence also revealed the genetic diversity in the transferrin binding region of different isolates of *T. evansi*. The cysteine protease gene of trypanosomes was exploited for identification of diagnostic marker and drug target of this parasite. The gene was amplified and identified on the basis of its size homology with that of *T. evansi* cysteine protease gene *i.e*. 324bp (Fig. 15).

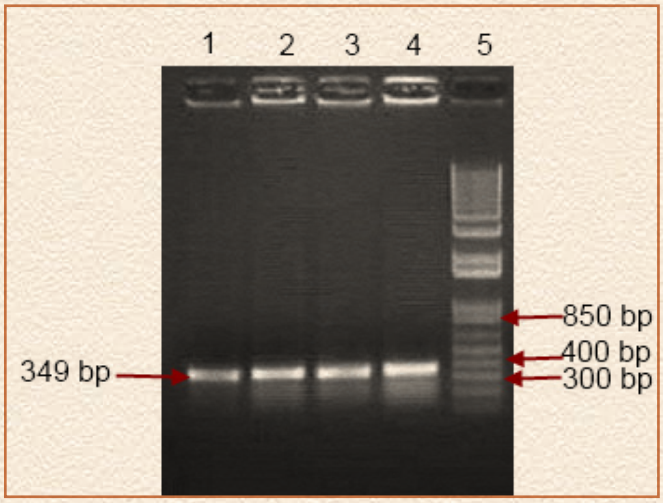


Fig.14. PCR amplification of transferrin receptor of *T. evansi*
(1-4: Amplicons; 5: 1Kb plus DNA Ladder)

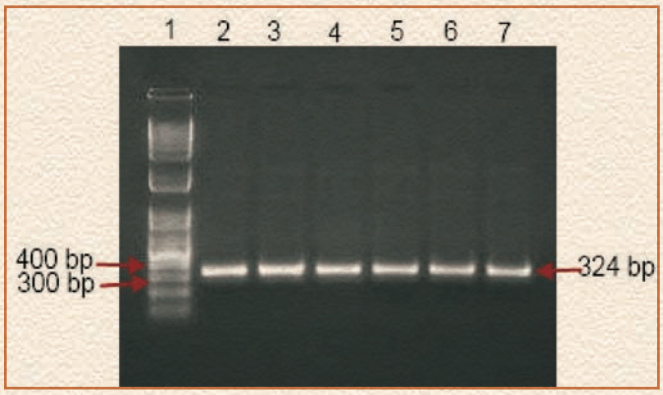


Fig. 15. PCR amplification of Cysteine protease gene of *T. evansi*
(1: 1Kb plus DNA Ladder; 2– 7: Amplicon of Cysteine protease gene of *T.evansi*)

Genes associated with cytokine system were identified from the camels infected with trypanosomes. Total RNA was extracted from PBMCs using Trizol and Isopropanol precipitation followed by cDNA synthesis using oligo-DT primer. Following gene specific amplification for Camel IL-10, IL-12 and IL-13, (Fig. 16 and 17) purification and subsequent cloning in pGEMT Easy vector system was done and sequencing of these genes is in process.

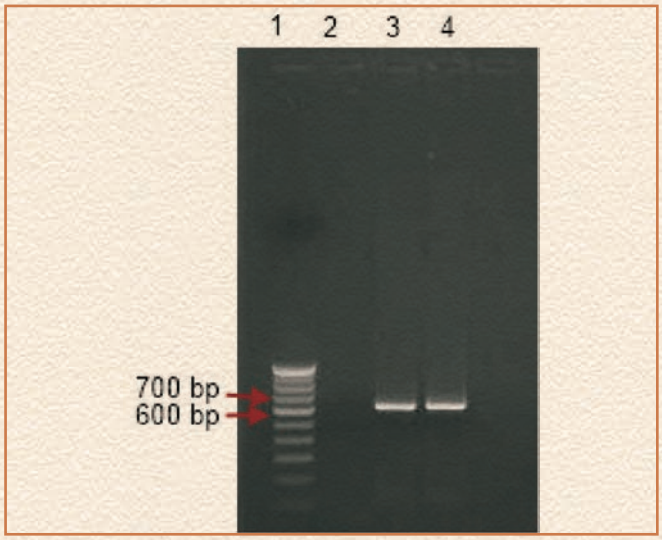


Fig. 16. PCR amplification of IL-10 gene of *T. evansi* infected camel
(1: 1Kb DNA Ladder; 3-4: Amplicons of IL-10)

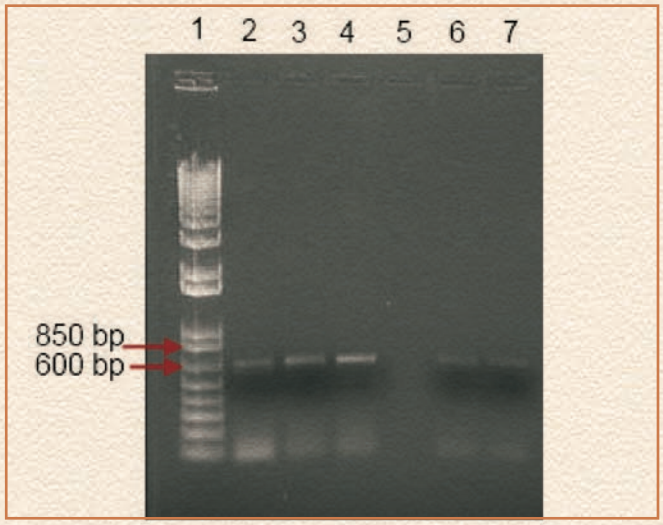
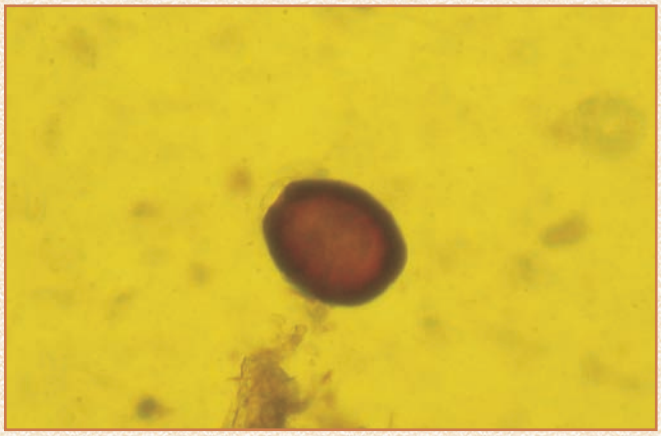
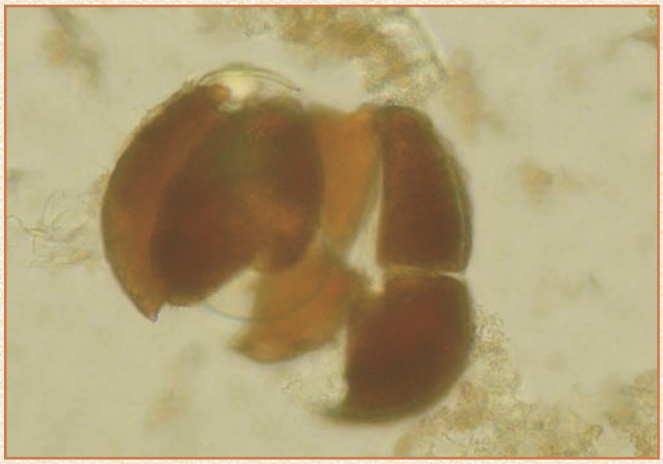


Fig.17. PCR amplification of IL-12 & IL-13 genes of *T. evansi* infected camel
(1: 1Kb plus DNA Ladder; 2-4: Amplicons of IL-12; 6-7: Amplicons of IL-13)

The faecal samples from two calves (<1 yr) having diarrhoea were found positive for *Eimeria spp.* Another camel was found infected with *Eimeria leuckarti* which is primarily an infection of Equidae. This may be the first report of this intestinal infection in camel. Following concentration by sedimentation, microscopic examination revealed thick walled, dark brown flattened oocyst with distinct micropyle (Fig 18 a and b.). The sporulation time recorded in the present study was 19 days at 37°C.



(a)



(b)

Fig. 18 a and b. Oocyst of *Eimeria leuckarti* collected from camel calf faeces

Eighty-eight samples were screened for mange (*Sarcoptes scabiei* var. *cameli*) infection which showed incidence throughout the year, affecting young camels of 1 to 3 years age (43.94%) of either sex.

Out of 343 collected faecal samples, 147 were found positive for GI helminthes and prevalence among different age groups revealed maximum level of infection (49.30%) in 1-3 years of age. The different types of GI infections recorded in camels were *Strongyles*, like *Haemonchus*, *Trichostrongylus*, etc. In addition to it *Strongyloides, Trichuris, Monezia* infection were also found in less number. Out of 5 camels examined on postmortem done at centre, 2 were found infected with Hydatid cyst in the lungs. The cysts were fertile in nature with the presence of growing protoscoleces (Fig.19) attached to the germinal layer.

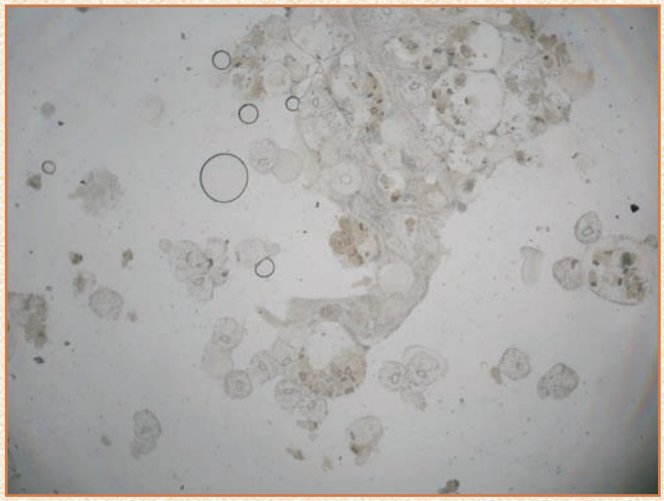


Fig. 19. Growing protoscoleces of *E. granulosus* (Hydatid cyst) collected from lungs of camel

Bacterial and fungal diseases

In a survey carried out in villages Morkhana, Husansar, Jaimalsar, Gigasar, Kesar-Desar, Boran and Gadwala of Bikaner district and Bhadav of Jodhpur district, a total of 349 clinical cases were attended during different seasons. Among these various infectious cases *viz.*, skin infections (21), actinobacillosis (6), enteritis/diarrhea (2), history of abortion (3), and upper respiratory tract (URT) infections (4) were identified. The appropriate samples (blood, skin scrapings, pus swabs) according to the infectious case were collected for cultural examination as well as isolation and identification of respective agent. The infectious

agents of *Microsporum nanum* (1), *M. canis* (2), *M. nanum* (1), *Trichophyton equinum* (1), *T. soudanense* (1), *Penicillium* spp. (1), *Aspergillus fumigatus* (1), *Aspergillus* spp. (2), *Candida albicans* (2) and *Paracoccoidiode*s spp. (1) infections were identified. Four field serum samples with history of abortion were screened at PDADMAS, Bangalore for brucellosis by Indirect ELISA and one was found positive for anti-brucella antibody.

Apart from this, characterization of 207 isolates of camel skin fungi to species level revealed *Candida albicans* (12), *Alternaria alternata* (13), *Epidermophyton floccosum* (8), *Scopulariopsis brevicaulis* (10), *Microsporum audouinii* (2), *M. canis* (11), *M. nanum* (15), *M. ferrugineum* (5), *Trichophyton verrucosum* (13), *T. mentagrophytes* (3), *T. schoenleinii* (1), *T. equinum* (5), *T. concentricum* (2), *T. tonsuran* (2), *T. violaceum* (2), *T. soudanense* (4), *T. rubrum* (3), *Sporothrix schenckii* (1), *Basidiobolus ranarum* (3), *Coccidioides immitis/posadasii* (4), *Penicillium marneffei* (3), *Penicillium* spp.(Unidentified) (4), *Curvularia lunata* (2), *Exserohilum rostratum* (1), *Absidia corymbifera* (5), *Rhizopus oryzae* (5), *Aspergillus flavus* (10), *A. fumigates* (6), *A. niger* (12), *A. terreus* (13), *A. versicolor* (4) and *Aspergillus* spp. (Unidentified) (21), *Paracoccidioides spp.* (2).

The ethno-veterinary practices for management of skin infections used by the camel farmers were also recorded and will be scientifically validated in future.

Viral diseases

Twenty scab materials were collected from camels infected with Contagious ecthyma in Udaipur District. Genes such as RNA binding protein (RBP) gene, Uracil DNA glycosylase (UDG), IL-10 and GM-CSF inhibitor and virion core protein (VCP) of pseudocowpox virus isolates from Indian dromedary camels were sequenced and submitted to the NCBI database. The genes of camel pox virus 11R (JQ917914), 201 R (JQ917915) and 6L (JQ728420) and pseudocowpox virus VCP (JN712918), RBP isolates of Bikaner (JN712917), Pali (JQ388235) and Udaipur (JQ388236), IL-10 (JQ728421), UDG(JQ728422) and GMCSFIF (JQ917913) from camels are published in NCBI database. Further, genes such as 6L, 201R, 11R and Toll-like receptor inhibitor of camel pox virus were amplified by PCR, cloned, sequenced and submitted to the NCBI database.

Deficiency /toxic and metabolic diseases

Under the survey work conducted during the year 2009 in Jodhpur, Jaisalmer, Barmer, Nagaur and Udaipur districts in monsoon and winter season, the blood samples collected were analyzed for micro minerals as shown in Table 18.

Table 18: Micro-mineral profile changes in healthy camels (Mean±SE)

Parameters	Season	Jodhpur	Jaisalmer	Barmer	Nagaur	Udaipur
Copper (mg/L)	Monsoon	0.9±0.1	0.09±0.0	0.1±0.0	0.06±0.0	0.4±0.1
	Winter	0.09±0.0	0.09±0.0	0.1±0.0	0.3±0.1	0.8±0.4
Iron (µmol/L)	Monsoon	28.3±3.7	24.9±3.4	28.1±2.5	30.7±5.40	29.7±2.2
	Winter	20.5±3.2	34.7±4.1	33.4±3.8	21.7±4.32	30.5±4.8
Zinc (µmol/L)	Monsoon	49.9±9.7	46.5±8.6	49.2±7.2	44.4±7.19	45.4±5.1
	Winter	47.7±7.0	46.7±6.1	40.8±4.5	36.8±5.18	36.4±5.5
Manganese (mg/L)	Monsoon	0.1±0.0	0.2±0.03	0.2±0.0	0.2±0.0	0.2±0.0
	Winter	0.2±0.0	0.3±0.05	0.3±0.0	0.3±0.0	0.3±0.1

Molecular cloning and characterization of cytokine gene(s)

Cytokine gene IL-10 of the dromedary camel was amplified from Con–A stimulated peripheral blood mononuclear cells using the forward primer IL-10: 5'accaaaccacaagtccgactcgacgaagaagaccc 3' and reverse primer IL-10R: 5'cttcttccctagaatgcttcagttcttc 3'. The annealing temperature for the above primer set is 57^0C. Subsequently PCR amplified DNA fragment (585bp) was successfully gel purified and ligated to pGEM-T Easy vector (Promega, USA) as per the manufacturer's instructions. The ligated mixture was transformed into DH5α *E. coli* competent cells. The bacterial colony harbouring the recombinant plasmids were confirmed by blue-white selection on LB agar plates containing ampicillin, IPTG and X-gal and colony PCR. The recombinant plasmids were isolated and the presence of the gene insert was confirmed by restriction enzyme digestion using EcoRI. Eventually, the bacterial colony harbouring the recombinant plasmid was submitted for sequencing and confirmed using NCBI blast. Simultaneously, sub cloning of the dromedary camel IL-2 gene in pPIC-Z alpha (a) vector was achieved successfully. Electroporation of the same into GS115 yeast cells was also carried out successfully.

Characterization of Toll Like Receptors (TLR)

Separation of PBMC's from blood was attempted and isolation of RNA and subsequent cDNA synthesis was done. The TLR-2 was amplified and cloned into pGEM-T vector successfully and submitted for sequencing.

Clinico-pathological investigations of herd

The cause of morbidity and mortality in clinical cases at Centre during the period of April 2011 to March 2012 were investigated. The disease conditions reported were trypanosomosis (22), haemonchosis (2), balantidiosis (2), dermatitis/ thikria (53), agalactia (4), abortions (10), dystokia (3), still birth (2), premature birth (4), congenital foetal anomalies (2), mastitis/ udder swelling (17), retention of placenta (8), prolapse of uterus (2), hypothermia (4), anaplasmosis (3), nematodirellosis (1), coccidiosis (2), microfilariosis (12), diarrhoea/ enteritis (39), uterine bleeding (2), impaction/ constipation (3), tympany (1), pyrexia (17), debility/ weakness (5), lameness (6), and mange (2).

Out of total 14 mortalities reported during the period of April 2011 to March 2012, the causes of mortality were found to be enteritis (3), septicaemia (2), toxaemia/ metritis/ peritonitis (1), tuberculosis (2), haemorrhagic shock (2), suppurative pneumonia (1), respiratory failure/ accidental death (1), hepatitis (1) and septic shock (1).

A total of 198 clinical samples were collected during the period, which included blood (162), milk (32), faeces (8) and abortion material (10). A total of 62 blood, 54 serum and 34 milk samples collected from pregnant, aborted and lactating female camels from centre farm were sent to VPH division, IVRI, Izatanagar, Bareilly for diagnosis of Listeriosis were found negative on culture and PCR.

Trypanosomiasis infected pregnant females showed abortions and premature births in last trimester of pregnancy. The aborted fetuses revealed congestion and hemorrhagic internal organs especially in kidney and brain. The foetal heart blood and impression smears from lung, liver, spleen and brain were found positive for trypanosomiasis.

Two camels died due to tuberculosis. The necropsy revealed many small button or pea sized nodules attached on the internal rib margin and pleural surface, lungs and mediastinal lymph node showed enlargement with calcified hard granulomatous tissue and congestion. The impression smears were found positive for acid fast bacilli (Fig. 20). The histopathology of lungs revealed typical granulomas with caseous necrosis and calcification surrounded by epithelioid cells, granulation tissue and capsule

of fibrous tissue (Fig. 21). Typical Langhans type giant cells were found at the periphery of granuloma. Acid fast bacilli were found inside macrophages in sections of lung tissue.

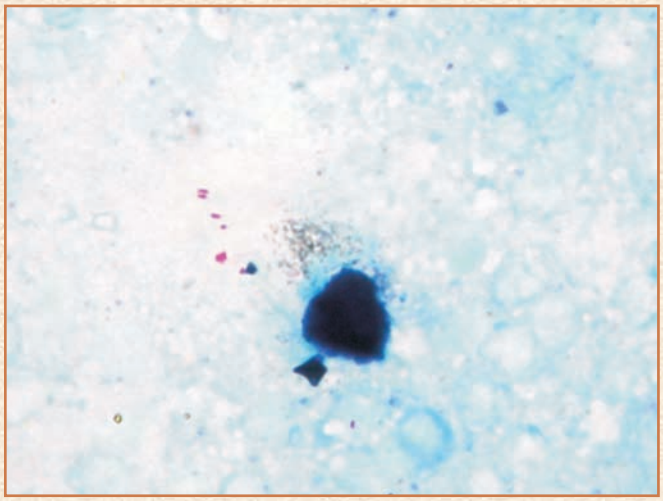


Fig. 20. Impression smear from mediastinal lymph nodes showing acid fast bacilli

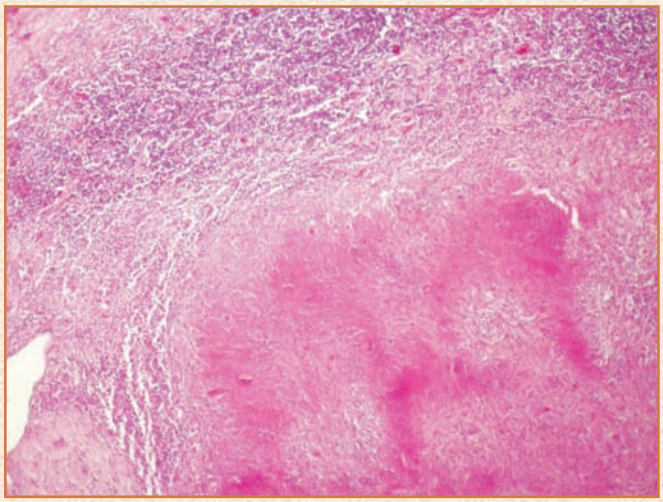


Fig. 21. Granuloma showing caseous necrosis surrounded by epithelioid cells, granulation tissue and fibrous tissue capsule.

A female having parturited one month before full term was found to be dull, depressed, anorexic with recurrent fever and died one month post-calving. Post-mortem findings revealed the presence of suppurative pneumonia. The culture of pus sample on SDA, revealed the growth of *Aspergillus* spp. fungus (Fig. 22).

Fig. 22. *Aspergillus* spp. on SDA

Two cases of still births revealed congenital foetal anomalies with incomplete development of diaphragm in one case and in another case complete absence of diaphragm (Fig. 23) causing the loop of intestine to enter inside thoracic cavity.

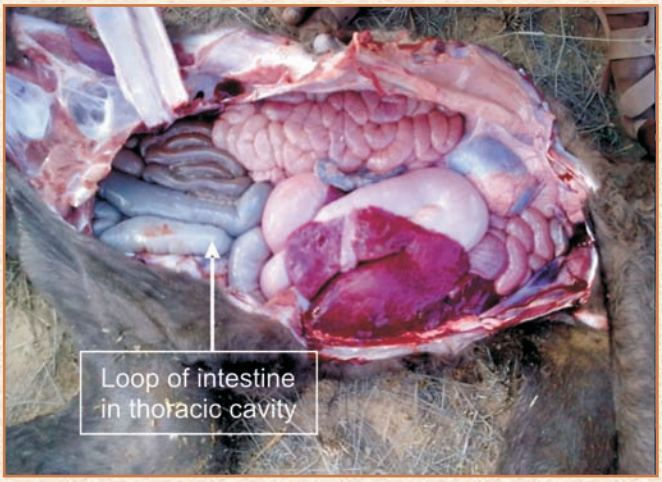


Fig. 23. Complete absence of diaphragm in still birth fetus.

Bionomics and Molecular Characterization of Ticks

For the bionomic study, ticks were collected from the camels (both male and female) of different places such as Jaimalsar, Deshnok and Jorbeer villages of Bikaner district, Jodhpur and Udaipur districts and from the centre farm and kept in

sterile bottles (Fig.24) with lid covered by muslin cloth. These were kept in the laboratory under different temperatures and humidity conditions as prevailed in the environment. Incubation period for egg laying and longevity of tick's life under different temperature and humidity was observed and it was found that an adult female tick took an average of 12 days for egg laying and had a life span of 30-40 days.

The ticks collected from different places were preserved in 70% ethyl alcohol for molecular characterization study. Genomic DNA was isolated from the female ticks by GENAXY- DNA isolation miniprep kit and stored at -20 °C for future use. Calreticulin (CRT) gene of camel tick was successfully amplified, cloned and sequenced. In phylogenetic tree (Fig. 25), the CRT gene of camel tick (*Hyalomma dromedarii*) was found to be closely related with *Hyalomma excavatum* and distantly with *Dermacenter andersoni* and *Hyalomma qinghaiensis*. The percentage of identity of nucleotide sequence of Calreticulin gene of *H. dromedarii* with other different species of hard ticks shows 97% identity to *Hyalomma excavatum* and 90% identity to the genus *Dermacenter*.

The tick's salivary glands from the engorged female ticks were isolated and stored at -20°C. Tick RNA was isolated from the salivary gland by using GENAXY- RNA isolation kit and stored at -80°C for future use. A pair of primer was designed on the basis of Internal Transcribed Spacer (ITS-2) gene sequences available in the NCBI data base. PCR amplification of ~1660bp expected amplicon was amplified from genomic DNA of ticks collected from Jorbeer, Bikaner. The amplified DNA fragments were cloned in pGEM-T Easy vector and transformed to *E. coli* DH5α. Clone of the Internal Transcribed Spacer (ITS-2) gene of Camel tick was successfully sequenced and its full length sequence has been submitted in the NCBI data base.

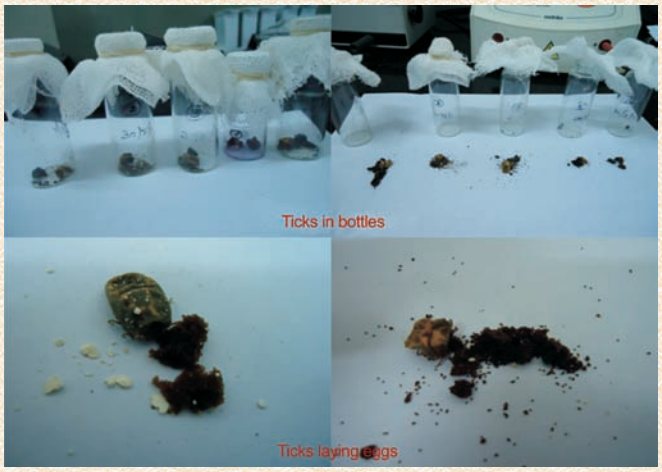
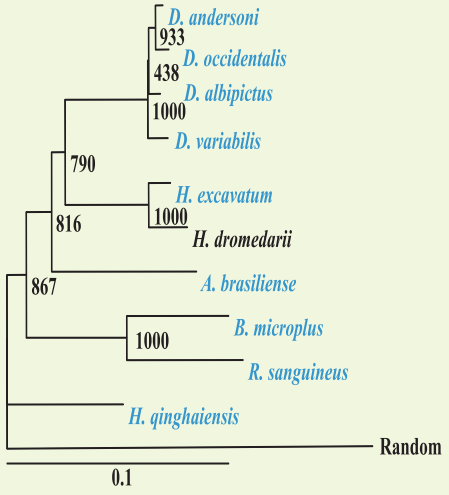


Fig. 24. Bionomics study of ticks



Phylogenetic tree based on nucleotide sequences of calreticulin genes of different species of ticks by neighbour joining method in Clustal X and Tree view 1.6.5. Horizontal distances are proportional to the genetic distances. Vertical distances are arbitrary. The numbers at each branch node represent bootstrap values (1000 replications).

Fig. 25. Phylogenetic tree based on nucleotide sequences of calreticulin genes of different species of ticks

Production of Single Domain Antibodies against Tuberculosis and Thyroid cancer (with BARC, Mumbai)

The presence of antibodies in the camel serum against hTg was confirmed. Total RNA was extracted from PBMNCs using Trizol method and was used for synthesizing cDNA. This cDNA template was used to amplify the region between VhH and CH2 domain of camel immunoglobulin

using primers CH2FORTA4 and VHBACKA6. The 600 bp band which is devoid of coding sequence for CH1 domain and corresponding to heavy- chain antibodies were used as template for further amplifying the VhH portion of the immunoglobulin using nested PCR. The nested PCR yielded amplicons of 450 to 520bp, which corresponds to the coding sequence of VhH. These amplicons will be further used for the production of recombinant VhH antibodies. Apart from this, Tg-IRMA assay is set up using the polyclonal Tg antiserum raised in camel.

Camel Nutrition

Rumen metagenomic studies under two different feeding systems

A preliminary trial to understand the microbial diversity in rumen was undertaken in two clinically healthy camels maintained on a) Guar (*Cyamopsis tetragonoloba)* pods husk and ground nut (*Arachis hypogea*) haulms (Sample A) and b) range land vegetation *viz.,* tree leaves of Khejri (*Prosopis cineraria*), pala (*Zizyphus numularia*), Anjan grass (*Cenchrus ciliaris*), Sewan (*Lasirus sindicus*) and Bhoorat (Aristida spp.) (Sample B). Rumen fluid collection using stomach tube/ororuminal probe and suction of rumen fluid through rumen fluid extraction unit was done and immediately placed on ice and stored at -80°C till further DNA extraction. Genomic DNA was extracted and the DNA purity and concentration was analyzed by spectrophotometric quantification and gel electrophoresis. Pyrosequencing and Sequence Analysis using 454 Life Sciences technology based high throughput sequencer (GS FLX Roche) were done at Anand Agricultural University, Gujarat. The read data was analyzed using Metagenomics RAST server 3.0. The summary of the data is as follows (Table 19).

Table 19: Summary of pyrosequencing data for camel samples of A and B diets

Data	Sample A	Sample B
Total number of sequences	17,135	24,770
Total sequence size (bp)	4,080,469	4,899,286
Average sequence length (bp)	238±116	197±109
ORF's	16,249	22,906
Predicted Protein Features	14,418	18,794
Predicted rRNA Features	2,595	4,410
Identified Protein Features	6,193	6,944
Identified rRNA Features	42	47
Identified Functional Categories	5,430	6,110
COG	2803	3084
KO	3030	3354
NOG	380	398
Subsystems	5931	6386
Taxonomic classification		
Bacterial domain	98.1%	97.2%
Number of hits	2961	2811

COG: Clusters of Orthologous Groups

NOG: Non-supervised Orthologous Groups

KG: KEGG Orthology (Kyoto Encyclopedia of Genes and Genomes)

Both groups revealed Bacteroidetes (> 50%) as the major phyla followed by Firmicutes and then Proteobacteria with varying percentage. The other phyla showed < 2 percent of hits. Comparision of the phylogenetic data up to genus level revealed Bacteroides as the major genus followed by Clostridia and others in both types of feeding systems.

Functional classification of rumen fluid metagenome in camels fed different diets: In sample A and B, a total of 6,193 (43.0%) and 6,944 (36.9%) of the predicted protein features were

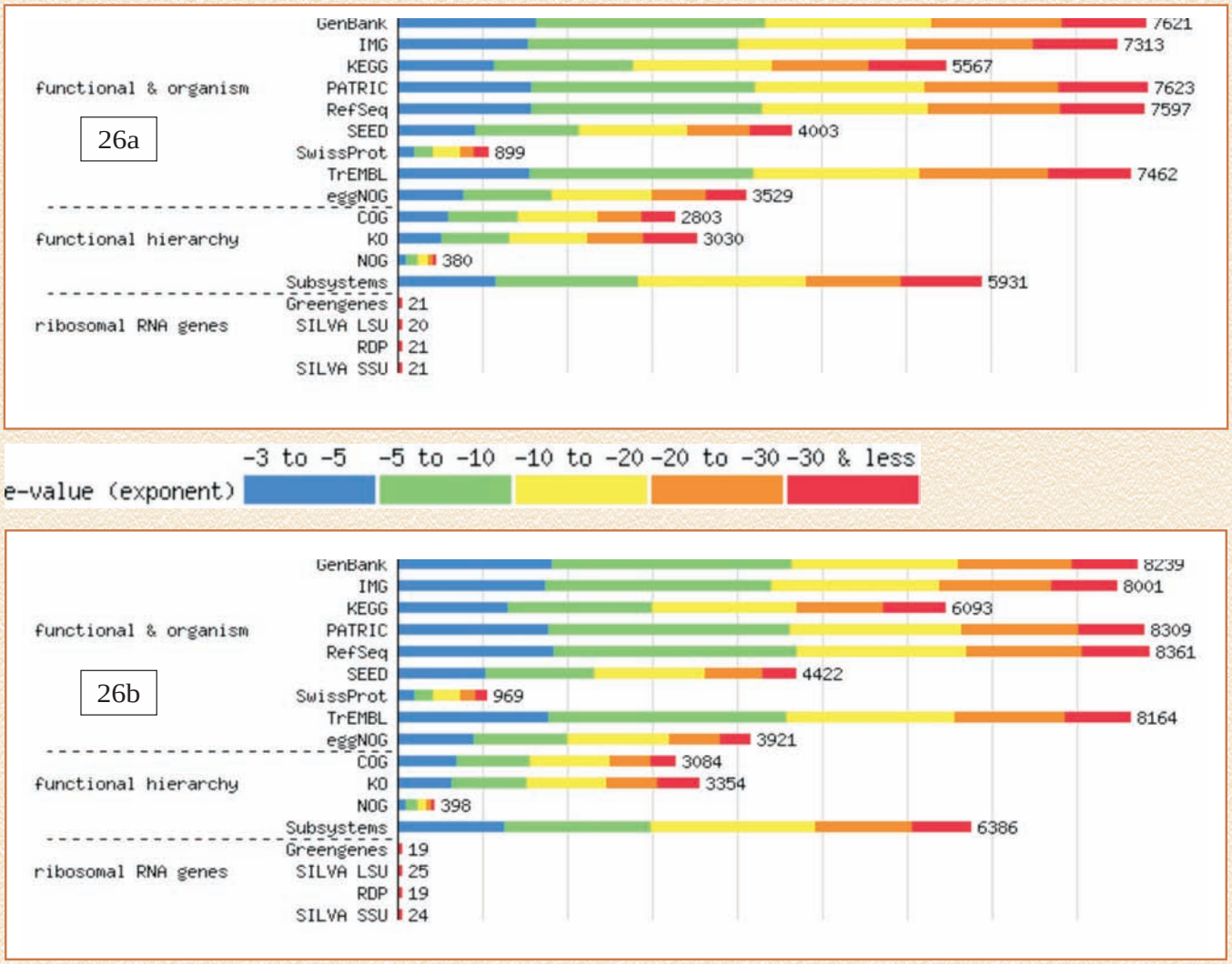


Fig. 26a and b. Number of features in datasets A (26a) and B(26b) that were annotated by the different databases

annotated with similarity to a protein of known function. 5,430 (87.7%) and 6,110 (88.0%) of these annotated features in A and B groups respectively, were placed in a functional hierarchy. 0.8% of reads had similarity to ribosomal RNA genes. Figure 26a and b display the number of features that were annotated by the different databases in samples A and B respectively. These include protein, protein with functional hierarchy information and ribosomal RNA databases. The bars representing annotated reads are colored by e-value range.

The functional data was compared to subsystems using a maximum e-value of $1x10^{-5}$, a minimum identity of 0%, and a minimum alignment length of 30bp. It is noticed that nucleosides and nucleotides forms the major functional group followed by the protein metabolism, carbohydrate metabolism, amino acids and derivatives, each having >10% reads. Remaining functional attributes have less than 10% of sequence reads/hits.

Pre-partum supplementary feeding

Thirty four pregnant dromedary camels in last 90 days of gestation divided into three groups on the basis of body weight were offered 2 kg, 3 kg and 4 kg of complete feed supplementation respectively with *ad lib* feeding of groundnut straw and 7-8 hrs grazing (Fig.27). Complete feed pellets of 10% CP

and 62% TDN were prepared from dry fodder 50%, Bajra grain 20%, Guar Korma 8%, Rice polish 2.5%, De-oiled rice bran 12.5%, Molasses 5%, Area specific mineral mixture 1% and Salt 1%. Two animals in Gr I and Gr II and 4 in Gr III were excluded from the study due to health problems.

In all the groups, the effect of pre-partum feeding on gain in body weights till calving, body weight loss due to parturition process and birth weight of calf born to different group females was non-significant in all the groups indicating the supplementary feeding of even 2 Kg during last 3 months of gestation was sufficient for optimum calving performance. The overall mean gestation period recorded was 381.48 ±2.85 days. At parturition, mean body weight attained by dams was 645.95±12.20 kg. During last 90 days of gestation, total gain in body weight was 110.22±6.46 kg with average daily gain of 1.33±0.06 (Fig. 28) and percent body weight loss due to calving was 7.90±0.15 (Table-20).

Table 20. Effect of pre-partum feed supplementation on body weight (kg) of dam and calves (Mean±SE)

Parameters	Gr. I (n=10)	Gr.-II (n=10)	Gr. III (n=8)	Over all mean±SE (n=28)
Initial B. wt.	529.30 ±15.53	539.10 ±20.35	535.63 ±26.49	534.61 ±11.43
B. wt. at calving	628.60 ±19.22	654.22 ±20.53	656.30 ±25.72	644.84 ±12.59
Total gain	99.30 ±11.80	112.80 ±5.71	120.68 ±15.79	110.23 ±6.46
% gain	15.61 ±1.61	17.75 ±0.82	18.42 ±2.29	17.04 ±0.91
ADG	1.20 ±0.08	1.32 ±0.06	1.52 ±0.14	1.49 ±0.08
Birth weight	36.6 ±1.54	37.35 ±1.13	36.91 ±2.29	36.98 ±0.86
% Loss	7.92 ±0.32	7.91 ±0.20	7.85 ±0.27	7.90 ±0.15
Gestation days	379.70 ±5.14	383.90 ±2.73	380.38 ±4.61	381.48 ±2.35

Fig.27. Supplementary feeding to pregnant camels

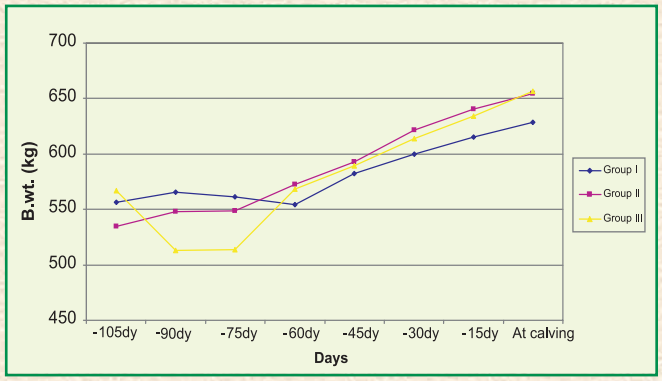


Fig. 28. Body weight Changes of pregnant camels during last phase of pregnancy

Supplementary feeding by complete feed pellets to calves under silvi-pasture system

Twenty camel calves of 1-2 yrs age divided into two equal groups on the basis of body weights Gr I (303±15.7) and Gr II (301±15.1) were maintained in two silvi-pasture areas of about 2.25 ha each for 2 months experimental period where rotational grazing was practiced for 1 month each for both the groups. The silvi-pasture areas developed at centre were having the components of grass- *C. ciliaris and Panicum antidotale*, along with trees *Z. numularia, P. cineraria, A. tortilis, S. oleidus and M. kankani*. The biomass yield from the grass components of silvipasture areas for 2 months period (Table 21) indicated that the grasses alone met the maintenance requirement of camel calves. Gr I calves were additionally fed 1 Kg complete feed pellets (10% CP and 62% TDN) as a supplementary feed in addition to grazing/browsing practice. During the

experimental period, the total gain in body weight (Kg) in Gr I calves was higher (15.20±5.3) than the Gr II calves (7.10±3.5) indicating that the supplementary feeding had beneficial effect on growth of calves.

Strategic supplementation in early lactation

In order to study the effect of strategic supplementation in their early lactation, 10 lactating camels (15 days post calving) were selected and divided into two groups on the basis of body weight and milk yield. Complete feed pellets having 50:50 concentrate and roughage ratio (10.3% CP and 62% TDN) were offered so as to meet 100 (Gr I) and 75% (Gr II) of requirement as recommended recently by the ICAR for a period of 70 days. Initially for 10 days, both groups were fed *ad lib* to know the voluntary feed intake. After this, Gr II animals were fed 75 % amount according to intake recorded for Gr I. The females in Gr I significantly gained 8.88 kg body weight while Gr II lost 26.08 kg b.wt. (Table 22 and Fig. 29) however no significant effect on milk yields (Fig. 30) and milk constituents and blood parameters was observed in two groups.

Table 21. Bio-mass yield and nutritional composition during study period

Date	No of Bunches	Length (cm)	Fresh wt.	% dry wt.	Yield q/ha	% DM	% CP
Dhaman (q/ha.)							
21.8.2011	940	206.2	80.8	27.41	22.14	39.04	8.50
13.9.2011	600	134	55	30.44	17.96	36.41	7.75
11.10.2011	175	117.5	11.4	91.36	10.41	44.09	4.50
28.10.2011	200	125	11.73	80.96	9.41	90.17	1.50
Grammna (q/ha.)							
21.8.2011	280	390	144.2	25.98	38.79	23.58	17.00
13.9.2011	240	318	186	26.45	49.21	30.62	10.75
11.10.2011	140	354	141	33.56	47.32	42.57	5.00
28.10.2011	150	352	82.5	44.35	36.59	65.88	4.50

Table 22: Performance of lactating camels on strategic feeding schedule

Parameters	Gr. I	Gr. II
Initial body wt. (kg)	601.32±23.06	597.00±27.23
Final body wt. (kg)	610.2±28.33	570.96±17.69
Gain/loss in wt. (kg)	8.88	-26.08
Average daily gain (kg/d)	0.132±0.14	-0.389±0.16
Milk yield (kg/d)	6.04±0.58	5.17±0.22
Total fat (kg/d)	0.20±0.018	0.16±0.012
Total protein (kg/d)	0.16±0.016	0.12±0.010
Total SNF (kg/d)	0.47±0.05	0.39±0.02
Blood biochemical parameters		
Glucose (mg/dl)	99.88±3.08	102.56±1.56
Total Protein (g/dl)	6.86±0.48	6.14±0.25
Creatinine (mg/dl)	1.39±0.04	1.19±0.002
Urea (mg/dl)	17.89±0.77	15.25±0.87
Cholesterol (mg/dl)	42.09±3.58	37.02±3.7
Calcium (mg/dl)	9.41±0.28	9.17±0.11
Phosphorus (mg/dl)	7.18±0.49	7.38±0.48

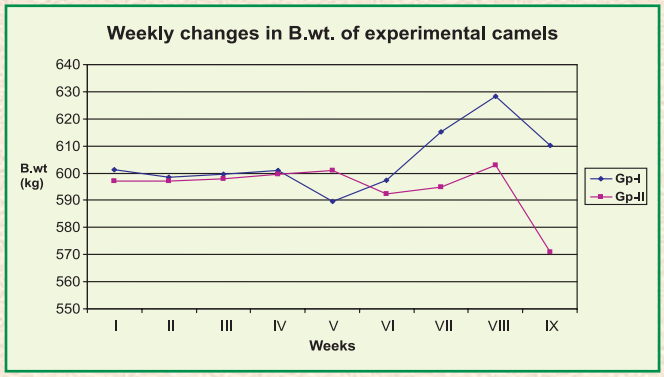


Fig. 29. Body weight changes of experimental camels

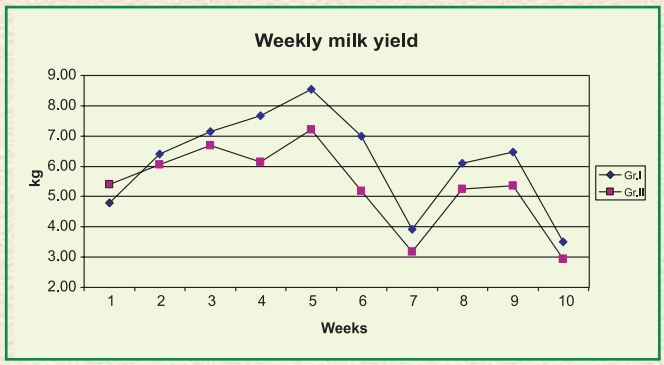


Fig. 30. Milk yield of experimental camels

Sexual maturity as affected by dietary protein levels

Growing camel calves of about 30 months age divided into 3 equal groups were individually fed for a period of 7 months on *ad lib* complete feed pellets prepared using feeds available locally having 50:50 proportion of roughage and concentrate and containing 9.80% CP (Gr 1), 12.91 % CP (group Gr 2) and 15.82 % CP (Gr 3). The performance with regard to growth, feed intake, feed conversion efficiency and cost of feeding indicated (Table-23) that calves fed on Gr-1diet had better gain and better feed conversion efficiency.

Table 23. Growth performance and feed efficiency of camel calves

Parameters	Gr-1	Gr-2	Gr-3
No. of camels	4	4	4
Initial Body weight (kg)	430.50±15.26	430.25±10.47	429.75±8.15
Final Body weight (kg)	576.75±22.31	535.25±8.75	517.00±12.92
BW Gain (kg)	146.25±10.96	105.00±5.72	87.25±9.45
ADG** (g/d)	0.687^{c}±0.05	0.493^{b}±0.03	0.410^{a}±0.04
DM Intake (kg)	1566.08±59.47	1450.60±33.09	1399.63±49.39
DMI (kg/d)	7.35±0.28	6.81±0.16	6.57±0.23
DMI (kg /100 kg BW)	1.46±0.05	1.41±0.05	1.39±0.04
DMI (kg/kg BW gain)**	10.80^{a}±0.40	13.91^{b}±0.64	16.53^{c}±1.51
Total feed intake (kg)	1708.40	1575.73	1525.13
Cost of feed (Rs./q)	686.00	672.88	663.34
Total Cost of feed (Rs)	11719.62	10602.77	10116.80
Cost (Rs)/kg gain	80.13	100.98	115.95

Different superscripts in a row differ significantly *P<0.05, P<0.01

All the camel calves who achieved body weight of more than 500 kg showed the rut symptoms like gurgling sounds, frequent urination, thumping of tails against genital organs, and standing with hind legs apart and it indicated that camel calves attained maturity.

Digestion trial conducted indicated that digestibility coefficients of DM, OM, EE, CF, NDF, ADF were similar except that of CP and NFE which differed significantly (P<0.05) among 3 groups (Table 24).The complete feed pellets Gr 1 having DCP 6.15 and TDN 63.35% seemed sufficient for optimum growth and feed efficiency and it maintained similar serum metabolite profile compared to groups fed on higher CP rations (Gr 2 and Gr 3).

Table 24. Digestibility and nutrient intake of feed pellets for male camel calves

Parameters	Gr-1	Gr-2	Gr-3
Body weight (kg)	526.75±15.48	509.25±8.06	488.00±12.73
Digestibility coefficients			
DM	63.89±0.96	64.28±0.89	63.86±2.05
OM	69.34±0.76	69.15±0.51	66.45±2.09
CP**	62.50^{a} ±1.39	70.58^{b} ±0.69	72.27^{b}±1.84
EE	78.12±1.63	78.80±1.28	75.28±1.45
CF	47.16±2.26	49.95±1.99	50.22±3.29
NFE*	75.65^{b} ±0.75	74.21^{b} ±0.70	70.36^{a} ±1.98
NDF	55.08±1.48	54.72±1.16	53.16±2.97
ADF	33.78±2.76	30.83±3.18	31.68±5.46
Nutritional value			
CP (%)	9.94	12.24	15.44
DCP (%)	6.15±0.20	8.54±0.13	11.72±0.75
TDN (%)	63.35±0.70	62.62±0.35	58.95±6.94
ME (MJ/kg)	9.54±0.11	9.43±0.05	9.11±0.22
Nutrient intake			
DMI (kg/d)	6.95±0.45	6.62±0.12	6.43±0.63
DMI (kg/100 kg BW)	1.32±0.06	1.30±0.03	1.33±0.16
DCP (kg)	0.43±0.03	0.56±0.01	0.75±0.08
TDN (kg)	4.41±0.34	4.14±0.08	3.91±0.46
ME (MJ)	66.41±5.09	62.40±1.27	58.95±6.94
DM (g/kg $W^{0.75}$)	63.07±3.22	61.74±1.41	62.29 ±7.11
DCP** (g/kg $W^{0.75}$)	3.88^{a}±0.26	5.27^{b}±0.12	7.27^{c}±0.82
TDN (g/kg $W^{0.75}$)	40.03±2.51	38.67±0.94	37.92±5.06
ME (MJ/ kg $W^{0.75}$)	0.60±0.04	0.58±0.01	0.57±0.08

Different superscripts in a row differ significantly *P<0.05, P<0.01

Rumen Microbes (Veterinary Type Culture Collection)

As per the objectives set for the year the Sugar utilization tests were done on the 12 bacterial isolates of camel for which 5 ml carbohydrate medium was inoculated with 0.2 ml of bacterial isolate culture and incubated at 39°C in BOD incubator for 24 hours. Optical density was recorded at 650 nm. All the isolates were able to utilize various sugars.

Molecular characterization of rumen anaerobic cellulolytic bacterial isolates:

Twelve cellulolytic bacterial isolates were used for molecular characterization and DNA was isolated by manual method. The DNA yield was of high purity between 1.8 - 2.0 and DNA ratio at 260/280 nm was recorded. The DNA samples were amplified on PCR using universal primers (Fig. 31), PCR purification was done using kit method and samples were sent for gene sequence and similarity pattern were seen to be 99% (Table 25).

Table 25. Sequencing results of bacterial isolates

Name of Isolate	Similarity Pattern	Query coverage	Similarity %
1	*Streptococcus equinus* (AB563242.1)	95%	99%
2	*Streptococcus* sp. L10 (HQ452825.1)	96%	99%
3	*Streptococcus equinus* (AB563242.1)	98%	99%
4	*Streptococcus equinus* (AB680225.1)	98%	99%
8	*Streptococcus equinus* (AB680225.1)	96%	99%
9	*Streptococcus bovis* (AY500370.1)	94%	99%
11	*Streptococcus* sp. L10 (HQ452825.1)	96%	99%
12	*Streptococcus* sp. L10 (HQ452825.1)	97%	98%

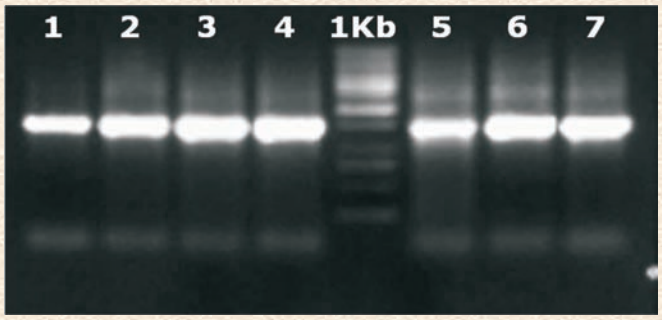


Fig. 31. Picture showing amplified 16S rRNA gene of various isolates

In vitro feed evaluation of different roughages and feed pellets IVDMD, total gas, total nitrogen, methane and for VFAs production.

The camel feeds and fodders viz., 4 fodder samples (Bajra kadbi, Barley straw, Guar phlagati, Groundnut haulms) and 3 feed pellets having 3 protein levels were evaluated in *in vitro* studies using camel rumen liquor. Total gas production was higher in feed pellets than on roughages and percent methane was quite variable (Table 26).

Trend of different VFAs indicated that acetate production was higher, followed by propionate and butyrate in all roughages and feed pellets. The yield of all the VFAs viz., acetate, propionate, butyrate iso-valerate and n-valerate was lower in case of barley straw, bajra kadbi and guar phalgati than feed feeds. The yield of other VFA of iso-butyrate was not much different among roughages and feed pellets. Lower yield of total VFAs was observed in case of barley and bajra straws.

During *in vitro* fermentation study, the Higher IVDM digestibility, total-N and VFAs were observed in feed pellets as compared to roughages (Table 27).

Table 26. *In vitro* total gas and methane production (ml) of different roughages and feed pellets.

S.No.	Feed	Incubation period(h)					Blank (ml)	Total gas*	% methane	% methane (total gas)
		3	9	15	24	48				
1	BS	16.00	23.50	48.50	57.00	69.75	73.00	142.75	6.79	4.76
2	BK	16.00	30.00	46.00	60.50	68.00	73.00	141.00	7.75	5.49
3	GP	24.50	34.50	51.00	60.00	68.50	73.00	141.50	6.29	4.45
4	GH	21.50	33.50	52.50	61.50	70.00	73.00	143.00	7.39	5.17
5	FP-1	21.33	37.33	55.00	61.00	76.67	73.00	149.67	8.24	5.50
6	FP-2	27.00	36.50	59.00	62.50	78.50	73.00	151.50	5.75	3.80
7	FP-3	16.00	27.67	54.67	60.00	70.33	73.00	143.30	7.83	5.47
	Control	12.67	13.67	14.67	14.67	14.67	73.00	87.67	2.10	2.37

BS- Barley straw, BK- Bajra kadbi, GP- Guar phalgati , GH- Groundnut haulms, FP- Feed pellet
*Total gas= Blank space of 73 ml + volume of gas at 48 hr

Table 27. Effect of different feeds and feed pellets on fermentation parameters

S.No.	Sample	pH	Digestibility %	Total-N mg%	VFAs (mmol/ 100 ml)
1	BS	6.52	63.54	18.98	4.15
2	BK	6.57	62.66	18.51	4.66
3	GP	6.55	81.61	19.68	5.08
4	GH	6.51	81.02	22.24	7.16
5	FP-1	6.21	84.67	21.23	7.97
6	FP-2	6.30	85.70	24.66	7.53
7	FP-3	6.43	89.59	24.73	7.08
8	Control	6.77	-	16.80	1.86

Partial substitution of Khejri (*Prosopis cineraria*) for Moth straw (*Phaseolus acontifolius*) as basic diet of camel feed

The association effect of mixing khejri (*Prosopis cineraria*) leaves as tanniniferous plant with Moth (*Phaseolus acontifolius*) chara as basic diet of camel feed was studied where 5 combinations of 10:90, 15:85, 20:80, 25:75 and 30:70 Khejri leaves:Moth chara on DM basis (Mix-10, Mix-15, Mix-20, Mix-25 and Mix-30, respectively were utilized for measurement of *in vitro* gas production, DM, OM and NDF degradability, partitioning factor (PF), and concomitant microbial mass. In the animal experimentation feed intake and digestibility trials were conducted and blood analysis was done for blood serum total protein (TP), albumin (Alb), triglyceride, tota3l cholesterol and blood urea nitrogen (BUN). Dr. Fawzy M. Abo-Donia from Agric. By-products Utilization Res. Section, APRI, ARC, Giza Egypt worked for this study under C V Raman International Fellowship for African Researchers.

Mixed diets showing increased levels of Khejri leaves in combination with Moth chara led to increased level of tannins.

In the incubation study at all hours of incubation gas production decreased with increasing level of Khejri leaves which was associated with increase of condensed tannins (CT) concentration, the higher effect was shown at 2.31 % CT. The maximum rate of gas production (b) was highest for Moth chara, followed by diet having 5% Moth chara replaced with Khejri leaves, and it was lowest for diets having 25% Khejri. The variation in gas production with increasing Khejri leaves can be attributed to negative effect for increase level of condensed tannins (Table 28).

Table 28. Gas production and it's kinetics for different tested diets through 24 hrs.

Item	Time in hr (ml/200mg DM)				Gas kinetics			
	4	8	16	24	a	b	c	a+b
Moth	6.67	12.63^{a}	19.63^{a}	24.10^{a}	-0.78	30.21	0.071	29.43^{a}
Khejri	3.00	6.63^{b}	10.30^{b}	12.77^{b}	-1.98	18.30	0.082	16.31^{b}
Mix-10	7.00	12.63^{a}	18.97^{a}	23.63^{a}	0.45	29.75	0.06	30.20^{a}
Mix-15	5.67	9.97^{ab}	16.63^{ab}	20.50^{ab}	-0.13	27.70	0.058	27.58^{ab}
Mix-20	6.33	10.63^{ab}	15.96^{ab}	19.70^{ab}	1.24	24.10	0.062	25.34^{ab}
Mix-25	6.33	9.97^{ab}	14.80^{ab}	18.30^{ab}	2.12	23.00	0.051	25.12^{ab}
Mix-30	4.17	7.88^{ab}	13.22^{ab}	16.40^{ab}	0.65	22.31	0.060	21.66^{ab}
±SE	1.189	1.695	2.344	2.803	1.644	3.963	0.011	3.474
P<	ns	*	*	*	ns	ns	ns	*

Disappearance of DM, OM and NDF for Khejri leaves lowered (P<0.05) significantly compared to Moth chara (Table 29), Mix-10, Mix-15, Mix-20, Mix-25 and Mix-30 respectively. With increasing level of Khejri leaves the disappearance rates of DM, OM and NDF were gradually lowered. A mixture of both Moth and Khejri at (10:90 and 15:85) was the favorable mix compared to other mixtures. High tannin content of Khejri lowered DM, OM and NDF disappearance of Khejri leaves in comparison with Moth chara.

The values of total nitrogen (TN) and NH_3-N were higher with incubation Mix-10 or Mix-15 compared with Moth chara or Khejri leaves but no significant (P>0.05) differences among different combination of Moth chara and Khejri leaves were observed (Fig. 32). The decreased rate and extent of protein degradation in the rumen as observed due to feeding of tannin-rich feeds could lower ammonia concentrations in the rumen and hence urea nitrogen excretion in urine. There was no significant (P > 0.05) effect among different combination of Moth chara and Khejri leaves on microbial protein (MP) and metabolisable energy (ME), while calculated MP was more affected at 1.85% CT as shown in Fig. 33. Methane production was higher (P<0.05) significantly with Moth chara compared to Khejri leaves, while no significant difference between moth chara and different combination with Khejri leaves.

Table 29. Degradability of DM, OM and NDF (%) for different tested diet after 24 hrs incubation.

Item	Ingredients		Different mixing levels						
	Moth	Khejri	Mix-10	Mix-15	Mix-20	Mix-25	Mix-30	±SE	P<
DM (%)	41.45^{ab}	26.57^{c}	45.13^{a}	42.56^{ab}	36.13^{bc}	34.53^{bcd}	30.28^{cd}	±2.510	*
OM (%)	43.62^{ab}	28.69^{c}	47.69^{a}	45.96^{a}	37.98^{b}	37.27^{b}	30.21^{c}	±2.209	*
NDF (%)	40.61^{abc}	27.10^{e}	44.44^{aa}	43.29^{ab}	36.20b^{dc}	35.47^{dc}	30.86^{de}	±2.287	*
PFOM	3.21	4.00	3.62	4.23	4.30	3.67	3.27	±0.765	ns

PFOM= partition factor according to dry matter disappearance

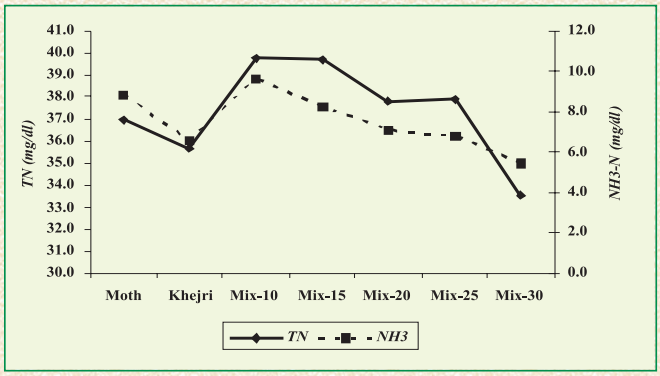


Fig. 32. TN and NH_3 (mg/dl) accumulated at different incubation time

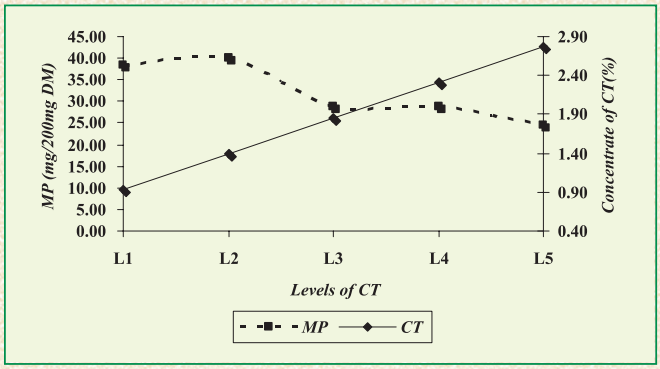


Fig. 33. Effect of different levels of CT on MP yield

Concentration of CT leading to negative correlation with DMD, OMD, NDFD, GP 24hr, MP, PF, ME, SCFA's, TN and NH3-N was observed while positive correlations were found between both OM and NDF with GP, ME, SCFA's, TN and NH3-N (Fig 34).

The results of simple regression between any of OMD, DMD, NDFD, NH3-N, TN, ME, PF, GP, SCFA's and CT are shown in Table 30. Using simple regression for prediction OMD, DMD, NDFD, NH3-N, TN, ME, PF, GP, and SCFA's was giving further clarity when included different levels of CT. The gas method has also been used successfully to predict the ME content of feeds.

In animal experimentation where Khejri and Moth chara were offered separately *ad lib* but as per choice (mix diet) and Khejri and Moth chara alone were utilized for feeding, the values of feed consumption of Moth chara and consumptions as combination Moth chara: Khejri leaves which came out to be 58.54 to 41.46, were higher ($P<0.05$) significantly compared to Khejri leaves as sole feed. The negative effects of high tannin concentrations on voluntary feed intake may be due to reduction in feed palatability, the slowing of digestion, and the development of conditioned aversions. A reduction in palatability may be due to a reaction between the tannins and the salivary mucoproteins, or through a

Table 30. Prediction of OMD, DMD, NDFD, NH3-N, TN, ME, PF, GP, SCFA's according to concentrate of CT.

Equation and factors used	R^2	Sig.
DMD= -8.17x+52.82	0.97	0.002
OMD= -9.45x+57.27	0.94	0.006
NDFD= - 7.57x52.05	0.94	0.006
GP= -3.61x+26.37	0.96	0.003
PF= -0.27x+4.32	0.21	0.446
ME= -0.46x+6.40	0.95	0.004
SCFA's= -0.64x+5.68	0.88	0.017
MP= -8.40x+47.62	0.84	0.030
NH_3-N= -2.14x+11.40	0.97	0.002
TN= -3.23x+43.58	0.86	0.024

Sig.: Significance of the portion of variation in the data explained by the model and r: correlation coefficient. DMD= DM Disappearance, 3OMD= OM Disappearance, NDFD= NDF Disappearance, GP= Gas production at 24h, PF= Partition Factor, ME= Metabolisable Energy, SCFA's= Short Chain of Fatty Acids, NH_3-N= Ammonia Nitrogen and TN=Total Nitrogen.

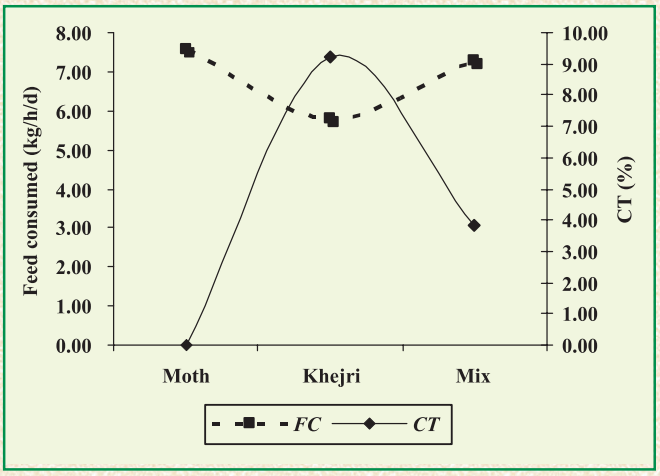


Fig. 34. Relationship between CT and feed consumed.

direct reaction with the taste receptors, provoking an astringent sensation.

Mixture of Moth char and Khejri leaves led to increase in digestion coefficient of DM (P<0.05) significantly compared to Khejri leaves alone as sole feed. These results might be due to increase tannins content of Khejri leaves. The digestibility of OM, CP, CF, NFE and hemicellulose of Khejri leaves were lowered (P<0.05) significantly with Khejri leaves as sole feed compared to Moth chara and mix between them. The same trend was shown with digestion coefficient of NFC and cellulose. The lower digestibility of CP and hemicellulose could be related to the lower degradability of Khejri leaves as affected by the higher condensed tannins. There are no significance (P>0.05) among groups for digestion coefficient of EE, NDF, ADF, and ADL. The nutritive values as TDN (%) were higher (P<0.0) significantly for either Moth chara (59.72) or mixed diet (52.52) compared with nutritive values of Khejri leaves (62.51). While DCP (%) values were not significantly different among tested diets and were 4.77, 6.02 and 6.11 respectively for Moth, Khejari and Mixed diets.

No significant (P>0.05) difference among groups for glucose, total protein and albumin was observed. Blood urea concentrate in groups fed Moth chara or feed mix were significantly (P<0.05) higher compared to that fed Khejri leaves. The feeding cost of either Khejri leaves or mix was higher compared to that feeding Moth chara. Therefore Moth chara is good feed for camels and could be nutritional and economically better than Khejri leaves especially in terms of energy and protein.

Camel Management

Adaptation of camel to changed climate

In a study to know the climate adaptability, 9 male camels were kept under shed having asbestos roof and fed under stall feeding conditions with watering once a day. Thermo-adaptive behavioral parameters were recorded at fortnight interval while some climatic parameters were also recorded at morning and evening time period from April, 2011 to March, 2012.

During the year the relative humidity varied from 34.34±3.58% to 65.55±3.42% during morning hours whereas during evening period it ranged from 7.69±4.67% to 43.99±5.99% and was significantly (P< 0.01) higher during morning as compared to evening period for all months. The morning THI varied from 59.98 to 80.78 and was significantly lower (P < 0.01) than evening THI (66.64 to 87.79). At THI below 71, the behavior was normal, moderate stress was observed at THI 71 to 79. And in severe climatic stress (at 80 to 87 THI) increase in body temperature and rapid and shallow respirations, water consumption and decrease in feed intake was observed.

During varying climate situations the physiological parameters like average rectal temperature (^{0}C) in morning and evening 36.7±0.07 and 38.70±0.10 (hot dry climate); 36.55±0.10 and 39.11±0.11 (hot humid climate); 35.89±0.09 and 37.94±0.10 (cold dry climate) varied significantly (P<0.01). The average pulse rate (beats / minute) in morning and evening 44.31±0.76 and 54.72±0.75 (hot dry climate); 49.51±0.72 and 60.59±0.80 (hot humid climate); 43.22±0.85 and 51.01±0.98 (cold dry climate) varied significantly (P < 0.01). The average respiration rate (breaths / minute) in morning and evening 13.85±0.45 and 15.81±0.43 (hot dry climate); 15.12±0.42 and 18.76±0.51 (hot humid climate); 11.55±0.40 and 15.04±0.46 (cold dry climate) varied significantly (P<0.01).

The Iberia Heat Tolerance Coefficient (IHTC) and Benezara Coefficient of adaptability (BCA) were worked out for all camels in three climatic conditions. BCA was significantly (P < 0.01) higher during evening as compared to morning.

Feed and fodder production

During the year 2011-12, the agricultural area of 65.5 ha was utilized for sowing fodder crops and total green fodder and seed production from

various crops grown was 1130.55 q and 95.69 q respectively. The fodder crops grown during the Kharif season were Bajra, Moth, Guar, Jowar and grasses like *C. ciliaris*, *L. sindicus* and *P. antidotale*. Dry fodders of guar and bajra were also produced to the tune of 179.6 and 58.00 q respectively. Guar seed production was 75.43 q and sale of it realized Rs. 7,16,585/- during this year. Silvi-pasture area of 9.75 ha of Dhaman (*C. ciliaris*) and Grammna (*P. antidotale*) were utilized by camels under grazing study from August to October, 2011. This year, 600 and 127 saplings of Neem, Khejri and other plants were planted respectively and have survivability of more than 80%.

During the monsoon season (June to October, 2011), all camels from were shifted to rangeland areas of the centre which saved 3092 q fodder and concentrates too fed during intensive feeding.

In the feed technology unit of Centre this year the 683 q pelleted complete and concentrate feed was produced by utilizing conventional and unconventional feeds and fodders for feeding general and experimental animals. Under TSP programme 86 quintal pellets and 100 kg area specific mineral mixture were distributed to the tribal people engaged in livestock husbandary in the districts of Dungarpur and Banswada.

Extension Activities

Exhibitions

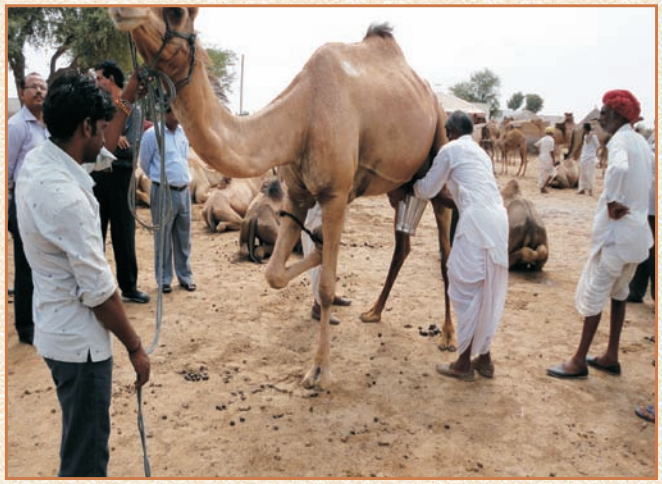
Five exhibitions were organized viz: (1) at international camel festival and art and culture festival, Bikaner from 6.1.12 to 8.1.12 (2) at Kissan mela, CAZRI, Jodhpur on 29.8.11 (3) at centre on 17.7.11; (4) NSD, Navalgarh, Jhunjunu, 28 -29th Feb'12; (5) ATC, Lunkaransar on 4.3.12.

Milk Competition

Five milk competitions of camel among farmer/ commodity interest group were organized viz: at villages like Haadla on 24.5.11, Morkhana on 16.7.11 and three at Centre (17.7.11, 28.1.12 and

Exhibition in camel festival at Bikaner

Kissan gosthi during milk competition at Morkhana on 16.7.11



Camel milk competition at village level

Farmers being explained about complete feed pellet

Release of "CAMMIN" area specific mineral mixture for camel

30.1.12) to promote camel as milch animal through new extension approaches.

Activities under Tribal Sub Plan

Under the Tribal sub plan budget allocation for the year 2011-12, the National Research Centre on Camel was provided the annual budget of Rs.10.00 lacs to undertake activities related to agriculture and animal husbandry in the identified tribal districts in the state of Rajasthan i.e. Banswara and Dungarpur and Leh-Ladakh area in Jammu & Kashmir. Accordingly the activities were planned in 3 phases during February and March months in Rajasthan. In the first phase a team of 4 experts consisting of scientists and senior technical officer visited the villages Pachlasa Bada, Ghatada, Barwasa Maafi, Barwasa Jagir, Garhi and Umrai (Tripur Sundari) in Banswara and Dungarpur districts from 28.02.2012-01.03.2012 and interacted with the farmers, local veterinary officers and the village panchayat personnel for providing the technical know-how and Animal Husbandry related information. The scientists also collected the information regarding the agriculture and animal husbandry related activities undertaken by tribals in the area and group meetings were arranged involving farmers, women and local veterinary/animal husbandry personnel. During the interaction with the animal husbandry officials it was informed to have similar programmes along with distribution of animal husbandry related literature in the next visit.

Double humped camel being fed pelleted feed 'KARABH'

Camel farmer with double humped camel in Leh.

During the second visit from March 19-21, 2012, the team of experts consisting of scientists and senior technical officer visited the villages Oda, Aspur, Sundanpur and Talwara in Banswara and Dungarpur districts wherein similar meetings with the local tribals along with AH officials were held. In the said meeting the tribals narrated the problems related to Agriculture, Horticulture and AH and requested to have major activities involving experts on the subjects for educating the farmers, tribal youth in the form of lectures, demonstrations and practical trainings and also to have animal health camp arranged in two villages of Banswara and Dungarpur districts respectively for which the local AH officials were requested to identify villages where the surrounding village farmers/tribals can participate in large numbers.

Double hump camel herd in Leh

In order to meet the requirement of tribal population engaged mostly in the agriculture and animal husbandry related activities, the activities of Kisan Goshthee, Practical Trainings, Demonstrations, Animal Health and Animal Judging camps were held in the villages Jolana in Banswara district and Dhani Khajoor, Taluka Aspur, district Dungarpur in consultation with AH officials like Jt. Directors, Dist. Dy. Directors and local Vety. Officers. The activities involved in these two days (27-28.03.2012) consisted of

Kissan Gosthi at Jolana dist Banswara

Kisan Goshthies involving experts of Agriculture, AH and Horticulture from NRC on Camel, Bikaner; CAZRI, Jodhpur; CIAH, Godhra; Anand Agricultural University, Anand and AH department officials from Banswara and Dungarpur. During this the lectures on various aspects of AH like better management, nutritional care, processing and preparation of camel and goat milk products, technologies of urea treatment of feed and fodder and importance of mineral mixture, reproduction and health care were delivered. In addition, the training programmes on preparation of milk products, preparation of UMMB and UMMM were conducted for the benefit of the farmers. During the Kisan Goshthis the problems related to Agriculgture, Horticultre, fodder production, range lands etc. were discussed and the experts satisfied the queries of the farmers on specific problems.

In the whole programme animal health camp activity was organised and treatment cases of about 411 animals were attended consisting of camels, cows, buffalos, sheep and goat. In addition the interested farmers and animal owners were provided the balance feed “Karabh” bag to about 180 and mineral mixture packets of 1 Kg each to 181 animal owners.

To undertake TSP activities in the state of J&K the area of double humped camel was selected and

Treatment of camels at Jolana dist Banswara

Treatment of camel in Khajur ki dhani,
dist. Dungarpur (Raj.)

a team consisting of experts in Nutrition, Health and Biotechnology visited during 20.03.2012 to 27.03.2012. During interaction and field visit of the camel inhabiting area in Leh town, it was felt that the animals suffer from shortage of feed and fodder during extreme winter months from November to February every year and supplementary feeding is essential to maintain normal health and to avoid migration to the higher altitudes. The supplementary feed "KARABH" prepared by NRCC was distributed to see the acceptability and palatability by double humped camels which were found to be quite better. While interacting with State AH official and scientists from DIHAR, it was apprised that there is need to have collaborative programmes to assure nutritional security, study unique immune system and adaptability of double humped camels.

Various extension activities were also organized under TSP at village Talwara (Banswara dist) and Ashpur (Dungarpur dist) on 1.3.12 and Village Jolana (Banswara dist) on 27.3.12, Dhani Khajur (Dungarpur dist) on 28.3.12 (Raj).

Farmers at camp in Khajur ki Dhani, Dist. Dungarpur

Distribution of extension literature to farmers


Camel dance during camel fair at the Centre.

Foundation Day celebrations

The Centre celebrated its 28th foundation day on 5th July, 2011 and during the fortnight celebrations from July 5-20, 2011, series of events were organised. On the occasion Dr. N.V. Patil, Director elaborated the achievements of the Centre and contributions made by the staff. Various sports competitions viz., Table Tennis, carom, chess, tug of war etc. were organised for NRCC employees. Kissan goshthi, camel health camp and camel milking competions were also organised in Morkhana village on 16.7.2011. Camel owners and farmers showed great enthusiasm towards these activities. A camel fair was organised on 17.7.2011 at NRCC campus. Different programmes including camel carting, camel riding, documentary film, camel museum, exhibitions, camel stall, camel decorations, camel dance, camel milking competions, press conference, feed technology exhibition, camel race, Kissan goshthi etc. were conducted throughout the day. Camel keepers, farmers, school students, teachers and local residents were given free access to these activities. Peoples had shown great interest in these activities. Chief Guest for the closing ceremony was Dr. A.K. Dhama, Vice-Chancellor, SKRAU, Bikaner and he stressed to work towards conservation of camel and further improvement in the livelihoods of camel keepers.

Farmer interface meeting

Three farmer interface meets were organized at Centre on 31.1.12; 30.4.11; 29.12.11 as research-extension-farmers-interface meeting covering different states viz. J & K, Rajasthan, Gujrat, Punjab, Haryana and UP.

Scientist-Stakeholders Interface Meet

A Scientist-Stakeholders Interface Meet was organized by the Centre during 28th-31st January, 2012 for dissemination of Centre's research activities and to facilitate the technical know-how related to camel. Farmers, stakeholders including NGOs, researchers and teachers from Rajasthan, Gujarat, Uttar Pradesh and Leh (J&K) participated in the meet. Chief guest, Dr A.K. Gahlot, Vice Chancellor, Rajasthan University of Veterinary and Animal Sciences, Bikaner, in inaugural speech emphasized that camel sustenance can be made by utilizing camel milk and its products in daily life. During the meet, participants were exposed to different aspects related to camel health, nutrition and feeding practices, breeding, physiology, reproduction, management of camel and also preparation of products from milk, hair, leather and bone through different technical sessions. Hands-on training were also given to farmers related to camel

handling and milking, feed block formulation and preparation, breeding and pregnancy diagnosis, milk products preparation etc.

Dr. Prithwi, Collector Bikaner was the Chief Guest of the closing ceremony stressed to strengthen the research and extension activities of the Centre so that the farmers will be more benefited.

MVSC Thesis

College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Science, Bikaner

"Clinical evaluation of ketamine and lignocaine as an epidural anaesthesia in camels *(Camelus dromedarius)*"

Jitendra Garhwal

Major Advisor: Naresh Raj Purohit,

Co-Advisor: Sumant Vyas

Clinical evaluation of epidural anaesthesia using Ketamine (5%) and Lignocaine (2%) done in 8 apparently healthy male camels divided into 2 groups (A and B) having 4 camels each, by recoding the onset, extent of anaesthesia, duration and recovery period. Temperature, pulse and respiratory rate were also recorded at different intervals. Under the dose rates of 0.25, 0.50, 0.75 and 1.00 mg/kg body weight of Ketamine, the induction period was 4.5±0.288, 7.0±0.408, 10.0±0.408, and 11.0±0.408 minutes, duration of anaesthesia was 54.5±1.040, 77.2±0.750, 93.7±1.314 and 93.2±0.853 minutes and recovery period was 40.5±0.957, 57.0±0.577, 74.0±1.471 and 74.2±0.629 minutes, respectively. The extent of anaesthesia at the dose rate 0.25 mg/kg body weight was tail, anus, perineum and scrotum. When dose was increased gradually up to 1.00 mg/kg body weight anaesthesia progressed distally up to toes and anteriorly sacro-lumbar region and posterior flank region and preputial sheath were also anaesthetized. Under the dose rate of 0.25, 0.50, 1.00 and 1.5 mg/kg body weight of lignocaine, the induction period was 12.0±0.408, 22.5±0.288, 25.0±0.408 and 23.7±0.629 minutes, duration of anaesthesia was 54.0±0.912, 65.5±0.288, 101.20±0.750 and 125.5±0.288 minutes and recovery period was 56.5±1.190, 69.0±0.577, 106.2±0.853 and 136±0.707 minutes, respectively. The extent of anaesthesia at the dose rate 0.25 mg/kg body weight was tail, anus, perineum and scrotum. When dose were increased gradually up to 1.50 mg/kg body weight anaesthesia progressed distally desensitizing complete hind limbs, anteriorly lumbo-sacral region, posterior flank region and ventral abdomen including preputial sheath were anaesthetized. There were non- significant changes in temperature, pulse and respiratory rate with Ketamine and lignocaine.

"Clinical evaluation of ketamine and bupivacaine as an epidural anaesthesia in camels *(Camelus dromedarius)*"

Mahesh Agrawal

Major Advisor: Naresh Raj Purohit,

Co-Advisor: Sumant Vyas

Clinical evaluation of epidural anesthesia using Ketamine (5%) and Bupivacaine (0.5%) done in 8 apparently healthy male camels divided into 2 groups (A and B) having 4 camels each, by recoding the onset, extent of anaesthesia, duration and recovery period. Temperature, pulse and respiratory rate were also recorded at different intervals. Under the dose rates of 0.25, 0.50, 0.75 and 1.00 mg/kg body weight of Ketamine, the induction period was 6.5±0.384, 9.8±0.512, 12.0±0.478, and 13.0±0.358 minutes, duration of anaesthesia was 34.5±0.740, 48.2±0.750, 55.7±1.314 and 67.25±1.853 minutes and recovery period was 37.5±0.957, 53.0±0.987, 58.0±1.071 and 74.2±1.429 minutes, respectively. The extent of anaesthesia at the dose rate 0.25 mg/kg body weight was tail, anus, perineum and scrotum. When dose was increased gradually up to 1.00 mg/kg body weight anaesthesia progressed

distally up to toes and anteriorly sacro-lumbar region and latero-ventral (posterior) aspect of abdomen up to the level of preputial sheath. Under the dose rate of 0.10, 0.20, 0.30 and 0.40 mg/kg body weight of bupivacaine, the induction period was 6.30±0.255, 12.32±0.585, 23.55±0.388 and 22.00±0.250 minutes, duration of anaesthesia was 38.75±0.578, 49.55±0.570, 55.00±0.398 and 81.75±0.568 minutes and recovery period was 95.75±0.578, 101.50±0.388, 127.85±0.478 and 144.75±0.678 minutes, respectively. The extent of anaesthesia at the dose rate 0.10 mg/kg body weight was tail, anus, perineum, scrotum and posterio-lateral aspect of hip region. When dose were increase gradually up to 0.40 mg/kg body weight anaesthesia progressed distally desensitizing complete hind limbs, anteriorly lumbo-sacral region, lower hump region and latero-ventral abdomen including preputial sheath and up to umbilicus. The temperature, pulse and respiratory rates were with in physiological range with Bupivacaine hydrochloride. The temperature with ketamine was also with in physiological range however the pulse and respiratory rate increased during epidural anaesthesia with ketamine in camels.

"Use of Collagenase Enzyme Type-1 to Improve the Seminal Characteristics of dromedary Camel Semen and to Improve Functional Activity of Dromedary Camel Spermatozoa"

Chandra Shekhar Saraswat

Major Advisor: G.N. Purohit,

Co-Advisor: Sumant Vyas

A total of forty semen ejaculates were collected during the breeding season from eight different stud camels using artificial vagina. All ejaculates were evaluated for ejaculation duration, semen volume, froth volume, color, pH and then spilt into 3 equal parts of aliquots. One aliquots was kept as control (A1) and two of these were diluted with tris buffer media in 1:1 with (A3) or without (A2) addition of 0.1% collagenase type-1 enzyme. All aliquots were pipetted to observe the macroscopic examination (Consistency and rheological (Thread formation) properties). Aliquot (A3) did not form thread when pipetted and showed thin watery consistency while the other two aliquots (A1 and A2) did evidence thick viscid, thick and thin watery consistency in different proportions. Only aliquot (A3) showed initial individual sperm motility and functional activity (HOST) curled tailed spermatozoa with overall average over 70%. There were significant differences ($p<0.01$) were observed between all the aliquots for sperm motility and sperm with functional membrane where as non-significant differences ($p<0.01$) between the all aliquots for live spermatozoa and sperm abnormalities percentage. An overall mean of sperm concentration in the camel semen treated with collagenase enzyme was 331.75±13.71 million/ml. The results showed that treating semen with 0.1% collagenase in tris buffer media improves semen macroscopic and microscopic seminal characteristics and also facilitates the separation of spermatozoa from seminal plasma in dromedary camel semen.

"Polymorphisms of Leptine (LEP) and Growth Hormone Receptor (GHR) gene in Goats by PCR-RFLP"

Vikas Sharma

Major Advisor: Dr. G.C. Gahlot

Co-Advisor: Dr. S.K. Ghorui

Leptin (LEP) and Growth hormone Receptor (GHR) gene play an important role intricately in the metabolism and growth of the animals. Genetic

variations in both the gene were investigated by PCR-RFLP using genomic DNA of 120 Indian goats (Marwari, Sirohi and Jamunapari). Polymerase chain reactions (PCR) were performed to amplify intron 2 of the leptin and intron 8 of GHR locus loci. Amplified PCR products were digested with restriction enzyme *Hinf I* and *DdeI I* for LEP and GHR loci, respectively. Digested PCR products were run on 2% of the agarose gel at 80 volts (V) for 60 to 90 minutes. Genotyping was performed according to the band pattern of digested PCR products. *Hinf I* and *DdeI I*, which carry restriction site in Leptin and GHR gene, yielded 338 and 84-bp, and 160 and 155-bp size fragments respectively in Marwari goats whereas no restriction site was observed in Sirohi and Jamunapari goats resulted in to monomorphic pattern for both the loci. The genotypes AA were observed in Sirohi and Jamunapari goats and BB genotype was observed in Marwari goats for LEP locus. No different band pattern was observed other than that of BB genotype. The frequency of the AA/BB genotype was found to be 1.00. Similar pattern was also observed for GHR locus in Marwari Goat (HH genotype) and Sirohi and Jamunapari goats (GG genotype). The combined genotype analyses of loci LEP and GHR showed that AAGG genotype of Jamunapari goats was significantly lower ($P<0.05$) body weight than Sirohi goats and BBHH genotype of Marwari goats at various stages of growth, the body weight of BBHH genotype was having significantly ($P<0.05$) higher than body weight of AAGG genotype in both breed.

The monomorphic pattern for Leptin and Growth hormone receptor gene in the present study could be used to identify Marwari breed from Sirohi and Jamunapari goats. However, a definitive conclusion requires a larger number of goats to be studied.

"Molecular Characterization of Defensin Gene of *Stomoxys calcitrans*"

Rakhee Verma

Major Advisor: Dr. G.S. Manohar,

Co-Advisor: Dr. S K Ghorui

The present study was carried out to characterize the defensin gene of *Stomoxys calcitrans* (stable fly) at molecular level which is a part of innate immunity of flies. For this study flies were collected from livestock animals. The total genomic DNA was isolated from the mid gut of flies using Proteinase K digestion coupled with phenol: chloroform extraction method. Using base sequence of Stomoxys fly, primers were designed for specific amplification of defensin gene from *Stomoxys calcitrans*. The defensin gene was successfully amplified from genomic DNA using Taq polymerase and was identified on the basis of its size homology with that of *Musca domestica and Aedes aegypti* (full sequence) in agarose gel electrophoresis i. e. 520 bp (partial sequence). The defensin gene of *Stomoxys calcitrans* was cloned in pGEM-T Easy vector and transformed in *Escherichia coli* JM109 strains. The cells containing recombinant plasmid identified on the basis of blue/white colony selection on LB agar containing X- Gal and ampicillin. The defensin gene was isolated from recombinant plasmids on ligation with restriction enzyme EcoRI and identified on the basis of its size. Using *Stomoxys calcitrans* as a model fly, further complete characterization and sequencing of defensin gene may provide an insight on the understanding of the new protective antigens and the development of drug and vaccines.

"Moleclar characterization of defensin gene from H*yalomma dromedarii* of camel"

Bhavana Rathore

Major Advisor: Dr. G.S. Manohar,

Co-Advisor: Dr. S K Ghorui

The present study was carried out to study the defensin gene of *Hyalomma dromedarii* of camels at molecular level which is a part of innate immune response of the tick. For this study *H. dromedarii* ticks were collected from camels and the total genomic DNA was isolated from the salivary glands of tick. Using base sequence of *Ixodes ricinus*, primers were designed for amplification of defensin gene from *H. dromedarii*. The defensin gene of *H.dromedarii* was successfully amplified from genomic DNA and was identified on the basis of its size in agarose gel electrophoresis as 580 bp. The amplified product was successfully cloned in pGEM-T Easy vector and transformed in *Escherichia coli* JM109 strains. The specificity of cloned defensin gene was confirmed from recombinant plasmids as identified on the basis of its size. This primer pairs can be used for characterization of defensing gene of *H. dromedarii*. Further complete characterization and sequencing of defensin gene may provide an insight on the understanding of the new protective antigens and the development of anti-tick vaccines.

"Molecular characterization of cysteine protease gene of T*rypanosoma evansi* from camels"

Anita Kumari

Major Advisor: Dr G. S. Manohar,

Co-Advisor : Dr. S K Ghorui

The present study was carried out to isolate the Cysteine Protease gene of *Trypanosoma evansi* using PCR and then the amplicon was cloned in a suitable plasmid vector. For this investigation, suspected *Trypanosoma evansi* infected camel was confirmed by making Giemsa stain slide of camel blood. After confirming infection, these parasites were propagated in swiss albino mice and when the mice had massive infection, was dissected for collecting blood and using DEAE cellulose chromatography method, purification of trypanosomes from blood of mice was done. DNA extraction was done from collected pellets of *Trypanosoma evansi* using the phenol-chloroform extraction followed by ethanol precipitation. The desired amplicon (cysteine protease gene) was then amplified using cysteine protease specific primers in PCR and identified on the basis of its size homology with that of *T. evansi* cysteine protease gene i.e. 324bp. The amplicon obtained was purified employing illustra GFX PCR DNA and Gel Band Purification kit. The purified amlicon was cloned in pGEM-T easy vector and recombinant plasmid was transformed in *Escherichia coli* JM109 strains. The cells containing recombinant plasmid identified on the basis of blue/white colony selection on LB agar containing X-Gal and ampicillin. The cysteine protease gene was isolated from recombinant plasmids on ligation with restriction enzyme EcoRI and confirmed on the basis of its size.

Picture

4. TECHNOLOGY ASSESSED AND TRANSFERRED

Feed Pellets

Feed pellets produced at Mini Feed Plant of the Centre were tested in camel calves and demonstrated the feed pellet technology to the camel owners at various platforms.

Area specific mineral mixture (ASMM)

Commonly fed basal fodders, trees, bushes and shrubs browsed by camel collected from different 4 agro-climatic zones were analysed for macro and micro nutrients based on feeding practices adopted by farmers in the area, the deficient minerals in diet of camels under prevalent feeding were worked out. ASMM (CAMIN) was prepared. Evaluation of ASMM at farmer door steps was found better for improving the health and production of camels.

Camel Milk Products

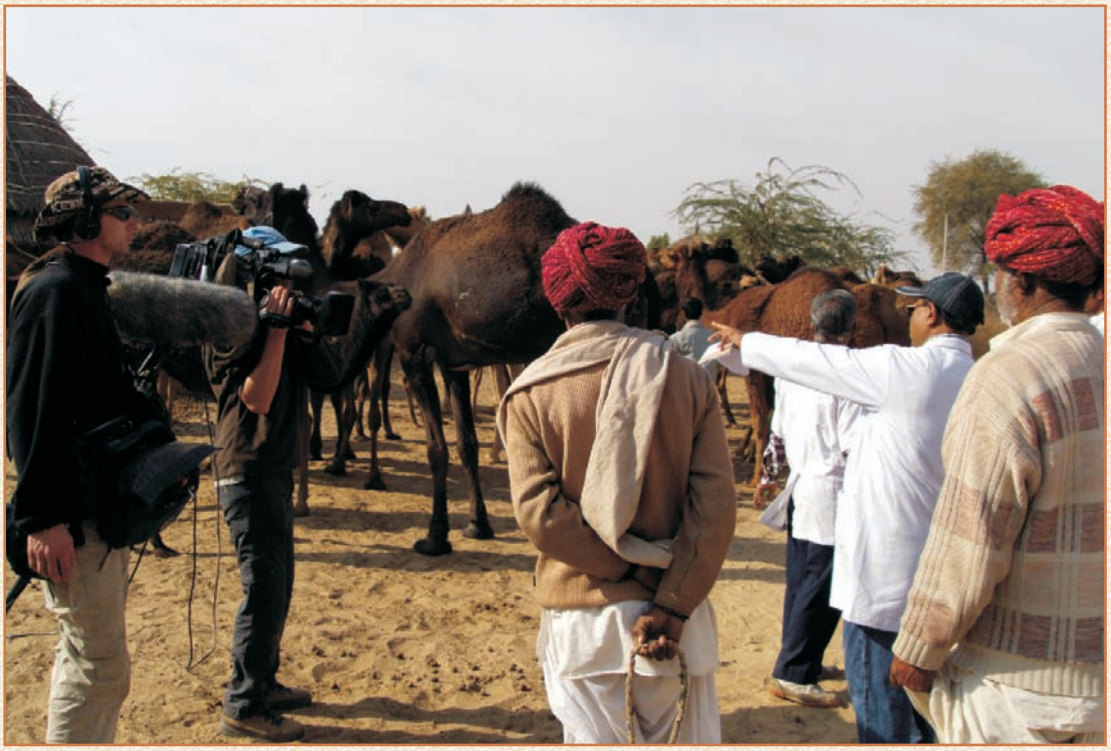
Rasogolla, sandesh, raabri, sweet lassi, frozen yoghurt with oat flour and spray dried milk powder were prepared and assessed.

Camel Ambulatory Clinics

Centre has started weekly visit of Camel ambulatory clinics for the benefit of camel farmers in surrounding villages of the Bikaner. Besides providing treatment to the farmers it is also facilitating scientists of the centre for various types of data collection as well as conduct of other extension activities of the centre. During the year, visits were made to villages Morkhana, Husansar, Jaimalsar, Hadla, Gigasar, Gadwala, Kesar-Desar Boran of Bikaner Districts. In these villages one visit was made on every Friday. A total number of 28 visits were performed during the year.

Distribution of feed pellets to the camel farmers

Training on milk products technology to farmers of Leh (J & K)



Activities of ambulatory clinic

Director participated in International Camel Conference, Jijiga, Ethiopia

5. Education, Training and Awards

International

1. Dr. Gorakh Mal got international training on Nutraceuticals under HRD program of NAIP for three month duration at Riddet Institute, Massey University, New Zealand on the topic "Bioactivity of traditional ingredients and milk protein" from January 17, 2011 to April 16, 2011.

National

1. Dr. D. Suchitra Sena attended a training on "Trends in bioinformatics and computational biology: Exploring systems in Molecular Biology" organized by NBAIM, Maunath Bhanjan, UP from July 16 to 29, 2011
2. Dr. Devendra Kumar participated in National Training Programme on "Basic and Applied Approaches in Designing of Dairy Based Nutraceuticals and Functional Foods" organized by Dairy Technology Division, National Dairy Research Institute, Karnal from July 18 to 27, 2011.
3. Dr. Shirish D. Narnanware attended a training on "IT based decision support systems on web based information management for knowledge sharing" organized by NAARM, Hyderabad, AP from August 03 to 12, 2011.
4. Dr. S.K. Ghorui attended Special Management Development training programme on "Creativity and Innovations" held at IIM Lucknow, under NAIP from August, 1-3, 2011.
5. Dr. Shirish D. Narnanware attended a training programme on "Analysis of Veterinary Science Data using SAS" organized by IVRI, Izatnagar, Bareilly, UP from November 21 to 26, 2011.
6. Dr. Raghvendar Singh attended training programme on ''Marketing Scientific Research and Innovation in International Business'' organized by Indian Institute of Foreign Trade in association with Ministry of Science and Technology, Department of Science and Technology at New Delhi during November 28 to December 02, 2011.
7. Dr. G. Sivakumar attended a training programme on "Applications of Nanotechnology in Animal Sciences" at NRC Equine, Hissar from February 1 to 10, 2012.
8. Dr. D. Suchitra Sena attented a training on "Recent Advances in Statistical and Computational genomics data analysis" organized by IASRI, New Delhi from March 19 to 28, 2012
9. Dr. Shyam Singh Dahiya has joined one year Post-Graduate Diploma course on "Technology Management in Agriculture-2011" at NAARM, Hyderabad.

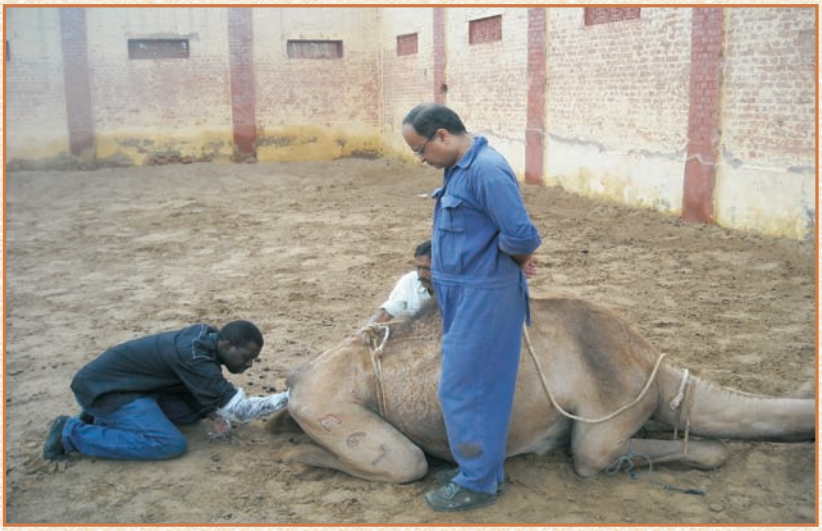
Glimpses of International Camel Conference, Jijiga, Ethiopia

6. Linkages and Eollborations

Collaborative University/ Institution

National	
Rajasthan University of Veterinary and Animal Science, Bikaner	Research work of MVSc and PhD students
Maharaja Ganga Singh University, Bikaner	Research work of PhD students
Sardar Patel Medical College, Bikaner	Development of anti-snake venom
Bhabha Atomic Research Centre, Mumbai	Development of single domain antibodies (SDA) for in vivo diagnosis/ therapy
Anand Agricultural University, Gujarat	Metagenomics of rumen microbes
Lokhit Pashupalan Sansthan, NGO at Sadri, Pali	Extension of camel husbandry practices
Sahjeevan, Bhuj, Gujarat	Extension of camel husbandry practices
Sher-e- Kashmir University of Agriculture and Technology, Srinagar	Conservation of Double humped camel
International	
APRI, Ministry of Agric. & Land Reclamation, Egypt	Training of Dr. Fawzy M. Abo-Donia, in Animal Nutrition sponsored by C.V. Raman fellowship of FICCI and Govt. of India.
University of Bari, Aldo Moro, Italy	PhD Research work of Dr Davide Monaco in Camel Reproduction
Supra Agro, Montpellier, France	Training to Ms Benedicte Benuelt, Master's student on camel reproduction
University of Goettingham, Germany	Short term training to Dr Abdussamad of Nigeria & currently PhD scholar in Germany on camel reproduction and management

Training to PhD scholar from Italy



Training to Nigerian PhD scholar at Germany on camel reproduction

Training to French student

7. List of Publications

Research Papers

1. Bera BC, K Shanmugasundaram, Sanjay Barua, G Venkatesan, T Riyesh, V Bhanuprakash, BR Gulati, RK Vaid, Nitin Virmani, NK Kakker, P Malik, Manish Bansal, S Gadvi, RV Singh, V. Yadav, Sardarilal, G. Nagarajan, V. Balamurugan, M. Hosamani, KML Pathak and R.K. Singh (2011). Zoonotic cases of Camelpox infection in India. *Veterinary Microbiology* 152, 29–38.
2. Bhakat C, Saini N and Pathak KML (2012). Influence of practice on performance of camel in various rearing condition of an organized farm. *Indian Journal of Animal Sciences* 82(3): 333-35.
3. Bhakat C and PK Nagpaul (2011). Effect of micro environment on physiological responses of kids. *Indian Veterinary Journal* 88 (9), 77-79.
4. Dedar RK, Yash Pal, S Kumar, SK Ghorui, RA Legha and RK Singh (2011). Therapeutic evaluation of Ivermectin against endoparasites of donkey. *Veterinary Practitioner* 12(1), 86-87.
5. Devendra Kumar & V. K. Tanwar (2011). Effects of incorporation of ground mustard on quality attributes of chicken nuggets. *Journal of Food Science and Technology* 48(6), 759-762.
6. Gorakh Mal, Sumant Vyas, Nirmala Saini, D. Suchitra Sena, Nandkishore and N. V. Patil (2011). Mineral status of blood and semen of dromedary camels. *Indian Veterinary Journal* 88(8), 72-73.
7. Mal G, S Vyas, D Suchitra Sena, Nand Kishore and NV Patil (2011). Biochemical charaacteristics of seminal plasma of dromedary camels. *Indian Veterinary Journal* 88(11), 87.
8. Mehta SC, Bissa UK, Patil NV and Pathak KML. (2011). Importance of camel milk and production potential of dromedary breeds. *Indian Journal of Animal Sciences.* 81(11) 1173-77.
9. Nagarajan G, Shelesh Kumar Swami, SK Ghorui, KML Pathak, RK Singh and NV Patil. (2012). Cloning and sequence analysis of IL-2, IL-4 and IFN-γ from Indian Dromedary camels *(Camelus dromedarius) Research in Veterinary Science* 92, 420-26.
10. Nagpal AK, Roy AK, Chirania BL and Patil NV. (2011). Growth, nutrient utilization and serum profile in camel calves as affected by dietary protein levels. *Indian Journal of Animal Nutrition* 28 (2), 166-71.
11. Nanda DK, SK Tomar, R Singh, Gorakh Mal, P Singh, DK Arora, BK Joshi, R Chaudhary and D Kumar. (2011). Phenotypic and genotypic characterisation of Lactobacilli isolated from camel cheese produced in India. *International Journal of Dairy Technology* 64(3), 437-43.
12. Nath K, N V Patil and Sajjan Singh. (2011). A case of bilateral fore limb adactyly in camel calf. *Journal of Camel Practice and Research* 18(1), 63.
13. Patil NV, Mathur BK, Patel AK and Bohra RC. (2011). Nutritional evaluation of *Colophospermum mopane* as fodder. *Indian Veterinary Journal* 88, 87-88.

14. Rishendra Verma, D Suchitra Sena, N Sharma, K Alex, R S Pamane, Rajendra Singh and K M L Pathak (2011). Molecular diagnosis of *Mycobacterium bovis* as the cause of tuberculosis in a camel. *Indian Journal of Animal Sciences* 81 (11), 1126–28.

15. Saini N, Kiradoo BD and Bohra DL. (2012). Mineral and bio chemical status in dromedary female camels. *Indian Veterinary Journal* 89 (3), 55-58.

16. Sena DS and N Sharma. (2011). Biochemical changes of tuberculosis in camels. Indian Veterinary Journal 89(3), 91-93.

17. Shrikant Sharma, Raghvendar Singh, Shashank Rana and Ravi Uniyal. (2011). IBPD: Integrated Bioactive Peptide Database. *International Journal of Drug Formulation and Research* 2(5), 369-75.

18. Shrikant Sharma, Raghvendar Singh, and Shashank Rana (2011). Domains Identification In Bioactive Peptide Sequences. *International Journal of Advances in Pharmaceutical Research* 2(9), 467-472.

19. Shrikant Sharma, Raghvendar Singh, Ekank Rana and Shashank Rana. (2011). Development of Web Interface For Mapping of Enzymes Involved In Gluconeogenesis In Oryza Sativa With Respect To Arabidopsis Thaliana Using In-Silico Comparative Genomic Approach. *International Journal of Advances in Pharmaceutical Research* 2(10), 507-11.

20. Shrikant Sharma, Sachin Kumar, Shashank Rana, Raghvendar Singh, and Ekank Rana (2011). In-Silico Analysis of Lactoperoxidase in Various Species and Prediction of Structures of Lactoperoxidase. *International Journal of Advances in Pharmaceutical Research* 2(10): 520-34.

21. Shrikant Sharma, Raghvendar Singh, and Shashank Rana (2012).Identification of Motifs in Bioactive Peptides Precursors". *International Journal of Biomedical and Advance Research* 3(1), 40-52.

22. Shrikant Sharma, Raghvendar Singh, and Shashank Rana. (2011) Prediction of Structures of Bioactive Peptides by Using Homology Approach". *International Journal of Biomedical and Advance Research* 2(12), 478-88.

23. Shrikant Sharma, Raghvendar Singh, and. Shashank Rana. 2011. Bioative Peptides: A Future Prospactive. *International Journal of Bioautomation* 15(4), 223-50.

24. Shashank Rana, Raghvendar Singh, and Shrikant Sharma (2011). Lactoferrin and TonB Dependent Receptor Database. *International Journal of Drug Formulation and Research* 2(5), 440-47.

25. Shashank Rana, Raghvendar Singh, and Shrikant Sharma. (2011). Prediction of lactoferrin like proteins from plant resources. *International Journal of Advances in Pharmaceutical Research* 2(9), 461-63.

26. Shashank Rana, Raghvendar Singh, and Shrikant Sharma (2011). Domains Identification in Lactoferrin Like Proteins..*International Journal of Advances in Pharmaceutical Research* 2(9), 464-66.

27. Singh S, Kumar Davendra and SMK Naqvi. (2011). Effect of progesterone impregnated intravaginal sponges plus PMSG on oestrus induction and conception in anoesterus buffaloes. *Veterinary Practitioner* 12(1), 99-101.

28. Singh S, Naqvi SMK and R Gulyani (2011). Effect of age of donor ewes on embryo production. *Veterinary Practitioner* 12(2), 241-43.

29. Singh S. (2011). Painless killing a painful decision for veterinarian. *Pashudhan* 37, 2-5.

30. D. Suchitra Sena, Gorakh Mal and SK Dixit. (2011) Effect of herbal immune modulator on growth rate. *Journal of Camel Practice and Research* 8(1), 31-34.

31. Tuteja FC, Ghorui SK and Chirania BL (2011). Odematous mastitis in camels (*Camelus dromedarius*). *Veterinary Practitioner* 12, 214-17.

32. Tuteja FC, Dixit SK, Kumar S, Patil NV & Singh JP (2011). Traditional treatment practices against camel diseases in Rajasthan. *Journal of Camel Practice and Research* 18, 231-42.

33. Verma R, D Suchitra Sena, N Sharma, K Alex, R S Pamane, Rajendra Singh and KML Pathak. (2011). Molecular diagnosis of *Mycobacterium bovis* as the cause of tuberculosis in a camel. *Indian Journal of Animal Sciences* 81(11), 1126-28.

34. Vyas S, N Saini, BD Kiradoo, A Lukha, N Kishore, G Mal and KML Pathak. (2011). Biochemical and trace mineral profile in post-parturient dromedary camel (*Camelus dromedarius*). *Indian Journal of Animal Science* 81(6), 586-87.

35. Vyas S. (2011.) Efficacy of Buserelin to induce ovulation in camel. Journal of Camel Practice and Research 18 (2), 1-3.

36. Vyas S, C Briant, P Chemineau, C le Danvic and P Nagnan-le Meillour. (2012.) Oestrus pheromones in farm mammals, with special reference to cow. *Indian Journal of Animal Sciences* 82 (3), 256-67.

हिन्दी में प्रकाशन

वैज्ञानिक-उष्ट्र भागीदार समन्वय कार्यशाला कंपेन्डियम में प्रकाशित आलेख

क्र.सं.	आलेख	पृष्ठ संख्या	लेखक
1.	राष्ट्रीय उष्ट्र अनुसंधान केन्द्र की विभिन्न हिस्सेदारी-धारकों के परिप्रेक्ष्य में भूमिका	1-7	नितीन वसन्तराव पाटिल
2.	भारतीय उष्ट्र अनुवांशिकी संसाधनों का संरक्षण	8-13	शरतचन्द्र मेहता
3.	ऊँट के नवजात बचचों की प्रमुख बिमारियों से बचाव के उपाय	14-17	काशीनाथ, सज्जन सिंह, एन.वी. पाटिल, एफ.सी. टुटेजा
4.	मनुष्यों को प्रभावित कर सकने वाले ऊँटों में चमड़ी के फफूँद रोग व इनका परंपरागत चिकित्सा पद्धतियों द्वारा ईलाज	18-23	एफ.सी. टुटेजा, डी. सुचित्रा सेना, श्याम सिंह दहिया
5.	ऊँटनी की गर्भावस्था एवं प्रसव उपरांत उचित देखभाल	24-26	बिहारी लाल चिरानियां
6.	नवजात टोरडे/टोरडियों का स्वास्थ्य प्रबंधन	27-30	डी. सुचित्रा सेना एवं एफ.सी. टुटेजा
7.	ऊँटों के पोषण हेतु सूक्ष्म खनिज लवण की आवश्यकता	31-33	निर्मला सैनी
8.	उष्ट्र दुग्ध एवं इसका कार्यात्मक गुण	34-37	देवेन्द्र कुमर, गोरख मल एवं राघवेन्द्र सिंह
9.	बदलते परिवेश में उष्ट्र का भविष्य	38-42	सज्जन सिंह
10.	ऊँटनियों में प्रसव पश्चात पुन:गर्भाधान-एक नवाचार	43	सुमन्त व्यास
11.	ऊँटों में गर्भपात के संक्रामक कारण	44-46	श्याम सिंह दहिया, जी. नागराजन, जी. सिवा कुमार, शैलेष कुमार स्वामी एवं शिरीष नारनवरे

वैज्ञानिक-उष्ट्र भागीदार समन्वय कार्यशाला कंपेन्डियम में प्रकाशित आलेख			
क्र.सं.	आलेख	पृष्ठ संख्या	लेखक
12.	ऊँट का रखरखाव एवं वैकल्पिक आय	47-50	चंपक भकत, गोरख मल एवं एन.वी. पाटिल
13.	अकाल में ऊँट की अनुकूलनता-टिकाऊ उष्ट्र उत्पादन हेतु पोषण प्रबंधन	51-54	अशोक कुमार नागपाल
14.	ऊँटों में होने वाली कुछ प्रमुख बीमारियों के लक्षण व उपचार	55-58	शिरीष डी.नारनवरे
15.	ऊँटनी के दूध से निर्मित विभिन्न दुग्ध उत्पाद	59-63	गोरख मल, देवेन्द्र कुमार, चंपक भकत, राघवेन्द्र सिंह एवं एन.वी. पाटिल

केन्द्र द्वारा "जन जातीय क्षेत्र में समग्र पशुधन विकास" पुस्तक में प्रकाशित आलेख			
क्र.सं.	आलेख	पृष्ठ संख्या	लेखनक
1.	शुष्क क्षेत्र में पशु उत्पादन बढ़ाने हेतु संतुलित पशु पोषण का महत्व व उपाय	1-7	एन.वी. पाटिल
2.	जन जातीय क्षेत्र में पशु अनुवांशिक स्त्रोतों का महत्व	13-20	शरत् चन्द्र मेहता
3.	जन जातीय विकास में पशु पालन का योगदान	21-23	सज्जन सिंह
4.	शुष्क क्षेत्र में बकरियों के लिये उन्नत पशु आवास व्यवस्था	24-26	ए.के. पटेल
5.	बकरी पालन और उसका स्वास्थ्य प्रबंधन	27-29	जी. सिवा कुमार, श्याम सिंह दहिया एवं जी. नागराजन
6.	राजस्थान में ऊँट पालन एवं प्रबंधन	30-33	उमेश कुमार बिस्सा, एफ.सी. टुटेजा एवं शरत चन्द्र मेहता
7.	नवजात ऊँटों का परिपालन	34-36	चम्पक भकत, गोरख मल, राघवेन्द्र सिंह, समर कुमार घौरूई, देवेन्द्र कुमार एवं एन.वी. पाटिल
8.	जलवायु परिवर्तन के कारण पशुओं में होने वाले संक्रामक रोगों का अग्रिम प्रबंधन	37-40	समर कुमार घौरूई, संजय कुमार एवं चम्पक भकत
9.	भेड़ों में स्वास्थ्य प्रबंधन	41-57	सी.पी. स्वर्णकार एवं शरत चन्द्र मेहता
10.	पशुओं में औषधियॉ देने की विधियॉ	58-59	राधाकृष्ण, सज्जन सिंह एवं काशीनाथ
11.	पशुओं में होने वाले प्रमुख जीवाणु जनित संक्रामक बीमारियों के लक्षण व उपचार	60-62	शिरीष डी. नारनवरे
12.	पशुओं में पेट बंध जाना (उदर अम्ल रक्तता)	63-65	एफ.सी. टुटेजा, डी. सुचित्रा सेना, जी. नागराजन एवं अविनाश शर्मा
13.	क्षय रोग के बारे में जानें	66-68	एफ.सी. टुटेजा, उमेश कुमार बिस्सा, सज्जन सिंह एवं नेमीचन्द बारासा
14.	पशुओं का पालन-पोषण	69-77	अशोक कुमार नागपाल, काशीनाथ, सज्जन सिंह एवं एन.वी. पाटिल
15.	पशु-आहार बट्टिका उत्पादन तकनीक	78-85	एच.सी. बोहरा एवं एन.वी. पाटिल

केन्द्र द्वारा "जन जातीय क्षेत्र में समग्र पशुधन विकास" पुस्तक में प्रकाशित आलेख			
क्र.सं.	**आलेख**	**पृष्ठ संख्या**	**लेखनक**
16.	वैज्ञानिक विधि से सूखे चारे की पौष्टिकता कैसे बढ़ाएँ	86-89	ए.के. पटेल एवं एन.वी. पाटिल
17.	पशु-पौष्टिक दाना: मरूस्थलीय पशुओं के लिए वरदान	90-93	एच.सी. बोहरा एवं एन.वी. पाटिल
18.	वन चरागाह प्रणाली से प्राकृतिक संसाधनों का टिकाऊ विकास एवं चारा उत्पादन	94-102	एम. पाटीदार एवं एन.वी. पाटिल
19.	पशुओं को वर्ष भर हरा चारा कैसे मिले	103-105	शीला चौधरी
20.	सूखे चारे को लाभदायक बनाना	106	शीला चौधरी
21.	पशु पोषण की नवीनतम जानकारियॉ	107-110	निर्मला सैनी एवं नितीन वसंतराव पाटिल
22.	लवण-बट्टिका उत्पादन तकनीक	111-113	एच.सी. बोहरा एवं एन.वी. पाटिल
23.	ऊँटनी के दूध का महत्व एवं उपयोग	114	गोरख मल, राघवेन्द्र सिंह, देवेन्द्र कुमार, चंपक भकत एवं एन.वी. पाटिल
24.	ऊँटनी के दूध से निर्मित पारम्परिक उत्पाद	118-121	गोरख मल, देवेन्द्र कुमार, चंपक भकत, राघवेन्द्र सिंह एवं एन.वी. पाटिल
25.	कैसे करें स्वच्छ दूध का उत्पादन	122-124	चम्पक भकत, राघवेन्द्र सिंह, गोरखमल, समर कुमार घौरूई एवं एवं एन.वी. पाटिल
26.	अश्व रखरखाव	125-136	राम अवतार लेघा एवं यशपाल
27.	अश्वों को लंगड़ापन के खतरे से कैसे बचाएं	137-139	राम अवतार लेघा, यशपाल एवं आर.के. देदड़
28.	खच्चर उत्पादन : एक लाभकारी व्यवसाय	140-144	यशपाल एवम् राम अवतार लेघा
29.	दक्षिणी राजस्थान के जनजातीय क्षेत्र आधारित बागवानी	145-150	दिलीप कुमार समादिया
30.	फल उत्पादन बढ़ाने की आधुनिक तकनीकें	151-159	बीरबल, वी.एस. राठौड़, एम.एल. सोनी, एन.एस. नाथावत, सीमा भारद्वाज एवं एन.डी. यादव
31.	कृषि उत्पादकता वृद्धि हेतु जैविक खाद एवं जैव उर्वरक प्रबंधन	160-168	एम.एल. सोनी, एन.डी. यादव, सीमा भारद्वाज व बीरबल
रा.अ.अनु. केन्द्र, बीकानेर द्वारा प्रकाशित कम्पेंडियम-2012 "समन्वित कृषि एवं पशुपालन प्रबंधन"			
1.	बदलते परिवेश में उष्ट्र दूध की उपयोगिता		राघवेन्द्र सिंह, गोरख मल, देवेन्द्र कुमार

Double hump camel at Leh

Kissan gosthi under TSP at Khajur ki Dhani Dist. Dungarpur (Raj.)

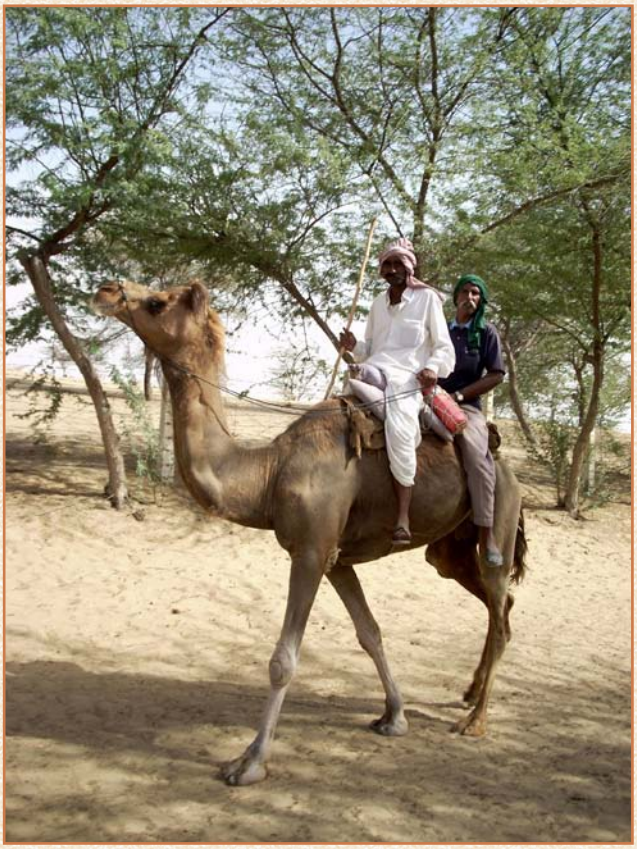
8. List of Ongoing Projects

S. No.	Name of Project with Institute code	PI, Co- PIs	Duration
1	Genetic improvement of milk production potential of Indian dromedary (AGB-7)	S. C. Mehta, U. K. Bissa and Sajjan Singh	2007-12
2	Genetic evaluation of performance of Indian Camel (AGB-8)	U. K. Bissa and Kashi Nath	2011-14
3	Structural analysis of 5'flanking region of dromedary milk protein gene(s) (AGB-9)	S.C. Mehta and S.S. Dahiya	2011-14
4	Epidemiology of infectious diseases of camel. (VM-8)		
	a. Epidemiology of Bacterial and Fungal Diseases of camels. (VM -8)	F. C. Tuteja, S.D. Narnaware and S.S. Dahiya	2007-12
	b. Epidemiology of parasitic diseases of camel (VM -8)	S.K. Ghorui,	2007-12
	c. Epidemiology of Viral diseases of Camels (VM -8)	G. Nagarajan, and S.S. Dahyia	2007-12
	d. Epidemiology of deficiency /toxic and metabolic diseases in dromedary camels (VM-10)	D. Suchitra Sena and N. Sharma	2007-12
5	Management of GI Parasites in camel herd and molecular characterization of anthelmintic resistant strains of parasites (VP-2)	S. K. Ghorui	2008-11
6	Camel rumen metagenomic studies under two different feeding systems (Technical Note)	N.V. Patil and D. Suchitra Sena	2010-12
7	Improving the efficiency of artificial insemination in camel using existing and emerging technologies (AR-5)	Sumant. Vyas and Gorakh Mal	2008-12
8	Role of sexual and bio-stimulation in camel reproduction (AR-6)	Sumant. Vyas, G. Mal and U. K. Bissa	2008-12
9	Enhancing nutrient utilization and reducing methane emission (AN-5)	A. K. Nagpal, D. Suchitra Sena, U. K. Bissa, N. Sharma and N.V. Patil	2009-12

S. No.	Name of Project with Institute code	PI, Co- PIs	Duration
10	Evaluation of feed pellets containing different protein levels in male growing camel calves (AN-6)	A.K. Nagpal	2011-12
11	Assessment of nutritional status of lactating camels for improving production performance (AN-7)	Nirmala Saini and N.V. Patil	2011-13
12	Adaptation of camel to climate change in relation to temperature humidity index (AP-6)	C. Bhakat and G. Nagarajan	2009-14
13	Physiological performance adaptability of camel under hot arid environment having different body condition scores (BCS) (AP-7)	Sajjan Singh, N.V.Patil and Kashi Nath	2011-14
14	Processing value addition and commercialization of different camel products and by products (AP-3)	G. Mal, C. Bhakat, D. Suchitra Sena, Devendra Kumar and R. Singh	2007-12
15	Production of single domain antibodies against rabies in camel (BT-AS-2)	S.S. Dahiya, S.K. Ghorui and G. Nagarajan	2010-13
16	Bionomics and molecular characterization of ticks infesting the camel (VP-3)	G. Sivakumar, S.K. Ghorui, F.C. Tuteja and G. Nagarajan	2010-13
17	Investigations on clinical cases for overall health improvement of camel herd (VPH-1)	S.D. Narnaware, F.C. Tuteja, S.K. Ghorui, Sivakumar, Narendra Sharma, B.L. Chirania and C. Bhakat	2010-13
18	Standardization of membrane process for development of functional camel milk food (LPT-1)	Devendra Kumar, G. Mal and R. Singh	2010-13
19	Molecular charactgerization of cameline cytokine gene(s) (BT-AS-1)	G. Nagarajan, S.K. Ghorui and G. Sivakumar	2007-12
20	Characterization of Toll-like Receptors (TLR) in Camel (BT-AS-3)	Shyam Singh Dahiya and G. Nagarajan	2012-13

External Projects or Inter-institutional collaborations

S. No.	Name of Project with code no.	PI/Co- PI	Duration
1.	Improvement of feed resources and nutrient utilization in raising animal production. (AICRP)	N. Saini, and Sumant Vyas	2003-12
2	Bioprospecting of genes and allele mining for heat and cold stress tolerance in Indian dromedaries (*Camelus dromederius*) (NAIP)	G. Nagarajan, S.C. Mehta and S.S. Dahiya	2009-12
3.	Network programme on Veterinary type culture- Rumen microbes (lead centre NIANP, Bangalore. (VTC - NAIP)	AK Nagpal, D Suchitra Sena, F. C. Tuteja and N.V. Patil	2009-12
4.	Development of a New Camelid Anti Snake Venom – SP Medical College, Bikaner. (VM- 9)	K.C. Nayak, B. K. Gupta, S. Kochar, P.D. Tanwar, S.K. Ghorui and G. Nagarajan	2007 (long term)
5.	Development of single domain antibodies for diagnosis/therapy-inter institutional project-BARC Mumbai. (BT-AS-2)	Venugopal, Meera Venkatesh, MGR Rajan, Grace Samuel, S.Subramaniam, Krishna Mohan, C. Kumar, J. Kumarasamy,(BARC), S.K. Ghorui and G. Nagarajan	2007 (long term)



9. ORT, IMC, RAC and IRC Meetings

Research Advisory Committee

The meeting of the RAC of NRCC, Bikaner was held in the Conference Hall of Rajasthan Veterinary Council, Pashudhan Bhawan, Jaipur on May, 15th, 2011 at 11.00 AM. Dr. Nagendra Sharma, Dr. N.V. Patil, Dr. N.D. Khanna, Dr. M. B. Chhabra, Dr. D.K. Mitra, Sh.Shankar Ji Rebari and Dr. Sumant Vyas were present in the meeting.

IRC Meeting

The Institute Research Council (IRC) meeting of NRCC for the year 2010-11 was held in the Committee Room, on 20th and 21st May, 2011.

Mid-IRC Meeting

The half yearly review meeting of the IRC was held on January 11, 2012.

Institute management Committee (First)

The Institute management Committee (IMC) meeting of NRCC was held on 18.11.2011. Dr. N.V. Patil, Dr. S. B. S. Yadav, Sh. Shankar ji Raibari, Dr. A.K. Patel, Dr. N.M. Singh, Dr. R.C. Sharma, Sh. K.P. Sharma, Dr. S.K. Ghorui, Dr. Sajjan Singh, Dr. Sumant Vyas and Sh. Raj Kumar were present in the meeting.

Institute management Committee (Second)

The Institute management Committee (IMC) meeting of NRCC was held on 10.01.2012. Dr. N.V. Patil, Dr. S. B. S. Yadav, Sh. Shankar ji Raibari, Dr. A.K.Patel,Dr. N.M. Singh, Dr. R.C. Sharma, Sh. K.P. Sharma and Sh. Raj Kumar were present in the meeting.

Vimochan of "Karabh" by Chairman and members RAC on 15.5.2011 at Jaipur

IMC meeting on 18.11.11

Half yearly meeting of IRC on 11.1.12

Meeting of RAC on 15.05.2011

10. Participation in Conferences, Meetings, Workshops and Symposia

Name	Meeting, Seminar, Workshops and Symposia	Date
Dr. N. V. Patil	Meeting of the committee for Updating of Nutrient Requirement at NIANP, Bangalore.	May 6, 2011
	Sub-Group Meeting of Planning Commission held at NASC Complex, ICAR, New Delhi.	July 13, 2011
	Meeting to act as expert for discussing the NRAA Project to suggest about fodder block production machineries at the project site on at CAZRI, Jodhpur	Aug.10,2011
	Participated in one day workshop on "Disposal of Appeal" under RTI on at ISTM, New Delhi	Aug. 19, 2011
	Kisan Mela organized by CAZRI, Jodhpur.	Aug. 29, 11
	Goga Meri fair (Hanumangarh) - the Camel fair and interaction with Animal Husbandry officials and the Camel owners.	Sept. 4, 2011
	Annual Conference of Indian Academy of Veterinary Nutrition and Animal Welfare at Veterinary College, Durg.	Sept. 24-25, 2011
	Committee meeting on "Updation of Nutrient Requirements" at NIANP, Bangaluru	Oct. 12, 2011
	One day Brain Storming Session on Livestock fertility organized by the National Academy of Agricultural Sciences at NAS Complex, New Delhi.	Oct. 15, 2011
	Paticipated in the International Camel Conference held at Jijiga, Ethiopia.	Oct. 27-28, 2011
	Interactive meet with pastoralists and agro pastoralists of different regions of Ethiopia at Jijiga,Ethiopia	Oct. 29, 2011
	Meeting of Animal Nutrition Group for Nutrient requirements on equine chaired by Dr. K. Pradhan at NRCE, Hisar.	Nov. 14, 2011
	International Workshop on "Cactus Crop to improve the rural livelihoods and to adapt to climate change in the arid and semi-arid regions" organized by ICARDA at National Bureau of Plant Genetic Resources, New Delhi, India	Nov. 25-26, 2011

Name	Meeting, Seminar, Workshops and Symposia	Date
	Meeting of 12th Plan EFC at Assam Agricultural University, Guwahati.	Dec. 24-25 2011.
	NAIP Sponsored National training programme entitled, "Advances in nutrient use efficiency in livestock production system" at CIRG, Makhdoom	Feb. 04, 2012
	Directors' Conference at NASC, New Delhi	Feb. 17-18, 2012
	Meeting with the Director, Dept. of Animal Husbandry, Govt. of Gujarat and Gujarat Co-operative Milk Marketing Federation (AMUL) regarding Camel Milk Marketing in Gujarat at AMUL, Anand.	March 10, 2012
	Tribal Sub-Plan (TSP) Programme, 2011-12 at Jolana (Banswara), Rajasthan and at Aspur (Dungarpur), Rajasthan	March 27- 28, 2012
	Board of management meets of Rajasthan University of Veterinary and Animal Sciences, Bikaner	4 meetings in 2011-12.
Dr S.K. Ghorui	Annual Convention and Convocation -2011 of National Academy of Veterinary Sciences (India) and Seminar on "Veterinary Profession: Challenges and Opportunities under WTO Regime" organized by Rajasthan University of Veterinary & Animal Science, Bikaner and National Academy of Veterinary Sciences (India)	Nov. 12-13, 2011
Dr. S.C. Mehta	Consultative Meet of Genomic Platform held at NBAGR, Karnal	Sept. 30, 2011
	Annual Convention and Convocation- 2011 of National Academy of Veterinary Sciences (India) and Seminar on "Veterinary Profession: Challenges and Opportunities under WTO Regime" organized by Rajasthan University of Veterinary & Animal Science, Bikaner and National Academy of Veterinary Sciences (India)	Nov. 12-13, 2011
	Impact Assessment Meet of NARS Scientists trained through International Trainings in Frontier Areas of Agricultural Sciences organized by Training Cell, NAIP at NASC, ICAR, New Delhi	Nov. 28-30, 2011
Dr. A.K. Nagpal	Pre-review Annual Scientific Meet of the Network Units of VTC, IVRI, Izatnagar	April 23, 2011
	Annual Scientific Review Meet of the Network Units of VTC, NRCE, Hisar	Sept. 23, 2011
	International workshop on Cactus crop to improve the rural livelihoods and to adapt to climate change in the arid and semi-arid regions of India on at NBPGR, New Delhi organized by International Centre for Agricultural Research in the Dry Areas, NASC complex, New Delhi.	Nov. 25-26, 2011
	Scientists-Stakeholders Interface Meet held at NRCC, Bikaner	Jan. 28-31, 2012
	Annual Scientific Review Meet of the Network Units of VTC, NRCE, Hisar	March 17, 2012

Name	Meeting, Seminar, Workshops and Symposia	Date
Dr. Sajjan Singh	Kisan Gosthi and milk competitions held at village Hadla (Bikaner) organized by NRCC, Bikaner	May 24, 2011
	Management Development Programme on "Strategies for Food & Agribusiness Sustainability" Indian Institute of Management, Lucknow (UP).	July 18-22, 2011
	National symposium on " Reproductive biotechnologies for augmenting ertility and conservation of animal species with special reference to North East hill region and XXVII annual convention of ISSAR at COVS&AH, CAU, Aizwal, Mizoram.	Sept. 27-29, 2011
	International Symposium on " Advaces in physiologic research for sustainable development of livestock and poultry production with satellite on strategic symposium physiological research for sustainable animal biodiversity organized by WBUA&FS, Kolkota	Nov. 2-4, 2011
Dr. U.K. Bissa	Annual Convention and Convocation of National Academy of Veterinary Sciences (India) and Seminar on Veterinary Profession: Challenges and opportunities under WTO Regime" at College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner	Nov. 12-13, 2011
	Scientists-Stakeholders Interface Meet held at NRCC, Bikaner	Jan. 28-31, 2012
	Tribal Sub-Plan (TSP) Programme, 2011-12 at Jolana (Banswara), Rajasthan and at Aspur (Dungarpur), Rajasthan	March 27- 28, 2012
Dr. R. Singh	National Meet on Stakeholder consultation on climate change organised by CRIDA, Hyderbad	Sept. 18-19 ,2011.
	Annual Convention and Convocation of National Academy of Veterinary Sciences (India) and Seminar on Veterinary Profession: Challenges and opportunities under WTO Regime" at College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner	Nov. 12-13, 2011
	International Conference on Functional Dairy Foods, organized by NDRI, Karnal, Haryana.	Nov. 16-19, 2011
	Scientists-Stakeholders Interface Meet held at NRCC, Bikaner	Jan. 28-31, 2012
Dr. S. Vyas	Meeting-cum-Workshop on "Towards more effective role of Head of Divisions & Regional Stations and PCs/PDs" held at CIAE, Bhopal.	June 14-16, 2011
	National Consultation on Water: Research Prioritization, at National Bureau of Fish Genetic Resources, Lucknow	Oct. 18, 2011

Name	Meeting, Seminar, Workshops and Symposia	Date
	Annual Convention and Convocation of National Academy of Veterinary Sciences (India) and Seminar on Veterinary Profession: Challenges and opportunities under WTO Regime" at College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner	Nov. 12-13, 2011
	"Livestock production in SE Asia" at NASC Complex, PUSA, New Delhi	Nov. 29-30, 2011
	Seminar on "Diagnosis and treatment of Reproductive Disorders in Ruminants" under ASCAD on Feb 8-9 at Suchna Kendra, Ajmer by Joint Director Animal Husbandry, Govt. of Raj.	Feb. 8-9, 2012
	Seminar on "Diagnosis and treatment of Reproductive Disorders" at CVAS, Bikaner by Joint Director Animal Husbandry, Bikaner, Govt. of Raj.	March 15, 2012
Dr. G. Mal	Kisan Gosthi and milk competitions held at village Hadla (Bikaner) organized by NRCC, Bikaner	May 24, 2011
	Kisan Gosthi and milk competitions held on at village Morkhana (Bikaner) organized by NRCC, Bikaner	July 16, 2011
	International Conference on Functional Dairy Foods, organized by NDRI, Karnal, Haryana.	Nov. 16-19, 2011
	Impact Assessment Meet of NARS Scientists trained through International Trainings in Frontier Areas of Agricultural Sciences organized by Training Cell, NAIP at NASC, ICAR, New Delhi	Nov. 28-30, 2011
	Scientists-Stakeholders Interface Meet held at NRCC, Bikaner	Jan. 28-31, 2012
	XL Dairy Industry Conference". IDA, New Delhi	Feb. 2- 5, 2012
	Tribal Sub-Plan (TSP) Programme, 2011-12 at Jolana (Banswara), Rajasthan and at Aspur (Dungarpur), Rajasthan	March 27- 28, 2012
Dr. F.C. Tuteja	Annual Convention and Convocation -2011 of National Academy of Veterinary Sciences (India) and Seminar on " Veterinary Profession: Challenges and Opportunities under WTO Regime" organized by Rajasthan University of Veterinary & Animal Science, Bikaner and National Academy of Veterinary Sciences (India)	12-13 Nov., 2011
	National Symposium on 'animal health Vis a Vis animal welfare with application of biotechnology with special reference to north-eastern region' & 30th Annual Convention of ISVM at College of Veterinary Sciences & A.H., Central Agricultural University, Selesih, Aizawl, Mizoram.	Feb. 1-3, 2012

Name	Meeting, Seminar, Workshops and Symposia	Date
	International Congress of canine Practice on 'Modern Concepts in canine Health and Diseases of human concern' & IX Annual Convention of Indian Society for Advancement of Canine Practice. Feb.9-11, 2012. Rajasthan University of Veterinary Sciences & Animal Sciences, Bikaner.	Feb. 9-11, 2012
Dr. (Mrs.) N. Saini	Annual Review Meeting of ICAR, AICRP on "Improvement of feed resources and nutrient utilization in raising Animal Production" held at Maharashtra Animal and Fishery Sciences University at Nagpur	Oct. 22-23, 2011
	Conference held by ANSI at G. B. Pant University of Agri. & Technology, Pantnagar.	Nov. 3-5, 2011
	Annual Convention and Convocation -2011 of National Academy of Veterinary Sciences (India) and Seminar on " Veterinary Profession: Challenges and Opportunities under WTO Regime" organized by Rajasthan University of Veterinary & Animal Science, Bikaner and National Academy of Veterinary Sciences (India)	12-13 Nov., 2011
Dr. C. Bhakat	National Symposium on resource utilization through integrated farming system organized by CAZRI- RRS, Bhuj	Dec. 20-21, 2011
	National workshop on stress agriculture and climate change, organized by ARS, RAU, Mandore	Dec. 22, 2011
	International Camel Festival 2012, Bikaner	Jan. 8-11, 2012
	International Congress of canine Practice on 'Modern Concepts in canine Health and Diseases of human concern' & IX Annual Convention of Indian Society for Advancement of Canine Practice. Feb.9-11, 2012. Rajasthan University of Veterinary Sciences & Animal Sciences, Bikaner.	Feb. 9-11, 2012
Dr.(Mrs.) D. S. Sena	Next-Generation Sequencing and Bioinformatics for Genomics & Health care. Rajiv Gandhi Institute of Biotechnology, Tiruvananthapuram, Kerala	Dec. 16-17, 2011
	Impact Assessment Meet of NARS Scientists trained through International Trainings in Frontier Areas of Agricultural Sciences organized by Training Cell, NAIP at NASC, ICAR, New Delhi	Nov. 28-30, 2011
	National Symposium on 'animal health Vis a Vis animal welfare with application of biotechnology with special reference to north-eastern region' & 30th Annual Convention of ISVM at College of Veterinary Sciences & A.H., Central Agricultural University, Selesih, Aizawl, Mizoram.	Feb. 1-3, 2012
Dr. G. Nagrajan	XXV Annual convention of IAVMI and International conference on Energizing animal health for better livestock production under WTO regime from, Bangalore.	June 9-11, 2011
	Scientists-Stakeholders Interface Meet held at NRCC, Bikaner	Jan. 28-31, 2012

Name	Meeting, Seminar, Workshops and Symposia	Date
Dr. S.D. Narnaware	Annual Convention and Convocation -2011 of National Academy of Veterinary Sciences (India) and Seminar on " Veterinary Profession: Challenges and Opportunities under WTO Regime" organized by Rajasthan University of Veterinary & Animal Science, Bikaner and National Academy of Veterinary Sciences (India)	Nov. 12-13, 2011
	XXVII Annual Conference of Indian Association of Veterinary Pathologists (IAVP), National symposium on "Innovative research Approaches for Diagnostic Pathology." Madras Veterinary College, TANUVAS, Chennai.	Dec. 29-30, 2011
Dr. D. Kumar	Kisan Mela organized by CAZRI, Jodhpur.	Aug. 29, 2011
	Annual Convention and Convocation -2011 of National Academy of Veterinary Sciences (India) and Seminar on " Veterinary Profession: Challenges and Opportunities under WTO Regime" organized by Rajasthan University of Veterinary & Animal Science, Bikaner and National Academy of Veterinary Sciences (India)	Nov. 12-13, 2011
	International Conference on Functional Dairy Foods, organized by NDRI, Karnal, Haryana.	Nov. 16-19, 2011
	Art and Cultural festival 2012, Bikaner	Jan. 6-8, 2012
	International Camel Festival 2012, Bikaner	Jan. 8-11, 2012
	Scientists-Stakeholders Interface Meet held at NRCC, Bikaner	Jan. 28-31, 2012
	Zonal Sports Tournament for Western zone (2012) at CAZRI, Jodhpur	Feb. 13-17, 2012
	Tribal Sub-Plan (TSP) Programme, 2011-12 at Jolana (Banswara), Rajasthan and at Aspur (Dungarpur), Rajasthan	March 27- 28, 2012
Dr. S.S. Dahiya	Scientists-Stakeholders Interface Meet held at NRCC, Bikaner	Jan. 28-31, 2012
	Art and Cultural festival 2012, Bikaner	Jan. 6-8, 2012
	International Camel Festival 2012, Bikaner	Jan. 8-11, 2012
	National Symposium on 'Animal Health Vis a Vis Animal Welfare with Application of Biotechnology with special reference to north-eastern region' & 30th Annual Convention of ISVM at College of Veterinary Sciences & A.H., Central Agricultural University, Selesih, Aizawl, Mizoram.	Feb. 1-3, 2012
Dr. G. Sivakumar	XXV Annual convention of IAVMI and International conference on Energizing animal health for better livestock production under WTO regime from, Bangalore.	June 9-11, 2011
	Scientists-Stakeholders Interface Meet held at NRCC, Bikaner	Jan. 28-31, 2012

11. Distinguished Visitors, Appreciation and Awards

Date	Name of visitors
27.04.11	Dr. R.K. Singh, Director, NRCE, Hisar
15.06.2011	Dr. Vivek Kumar, Ministry of Home Affairs, New Delhi
20.07.2011	Prof. A.K. Dahama, Hon'ble Vice Chancellor, Swami Keshvanand Raj.Kirshi Vishava Vidhyalaya, Bikaner
20.07.2011	Dr. S.K. Sharma, Director, CIAH, Bikaner
3.08.2011	Dr. S.C. Gupta, ADG (AP&B),ICAR, New Delhi
06.08.2011	Prof. K.M.L. Pathak, DDG (AS), ICAR, New Delhi
06.08.2011	Dr. Chanda Nimbkar, Member, ICAR governing body, New Delhi
06.08.2011	Dr. A.K. Purohit, Ex Director Ext. RAU, Bikaner
15.08.2011	Sh. P.R. Bhagwat, Additional PS to Union Agriculture Minister, New Delhi.
7.10.2011	Dr. M.J. Chandre Gupta, Additional Commissioner(Extention), Krishi Bhavan, New Delhi.
15.10.2011 and 11.11.2011	Dr. R.M. Acharya, Former DDG(A.S.) I.C.A.R., New Delhi
11.11.2011	Dr. P.K. Uppal, Ex. Director, NRCE, Hisar
11.11.2011	Dr. A.K. Shrivastav, Director,NDRI, Karnal
30.11.2011	Sh. Dani Thomas, Principal Chief Engineer, N W Railway, Jaipur.
12.11.2011	Dr. Gaya Prasad, ADG (Animal Health), ICAR, New Delhi
4.12.2011	Dr. O.P. Dhanda, Ex. ADG, ICAR, New Delhi
26.12.2011	Sh. Girish Chandre Gupta, Judge Calcutta High Court, West Bengal
29.12.2011	Dr. K.M.L. Pathak, DDG (AS), ICAR, New Delhi
5.01.2012	Dr. S.K. Dwivedi, Ex. Director, NRCE, Hisar
24.01.2012	Dr. Mohan Bhagwat, Nagpur.
28.1.2012	Dr. A.K. Gahlot, Hon'ble Vice Chancellor, RAJUVAS, Bikaner
28.1.2012	Dr. M.A. Pal, Director Research, SKA&STU, Kashmir
31.1.2012	Dr. Prithvi, District Collector, Bikaner
5.02.2012	Dr. Anubrata Das, Director, National Research Centre on Pig, Guwahati
02.03.2012	Dr. D. Swarup, Director, CIRG, Makhdoom
13.03.2012	Dr. K.S. Ramachandra, Member, NRAA, planning commission, New Delhi.
16.3.2012	Dr. B. S. Prakash, ADG (AN&P), ICAR, New Delhi
26.03.2012	Dr. M.M. Roy, Director, CAZRI, Jodhpur

Appreciation and Awards

Oral presentation

Dr. F.C. Tuteja got 3rd prize for oral presentation in National Symposium on 'animal health vis a vis animal welfare with application of biotechnology with special reference to north-eastern region' & Annual Convention of 30th ISVM. Feb.1-3, 2012 at CVAS&AH., CAU, Selesih, Aizawl, Mizoram.

Nagar Raj Bhasha Appreciation Award

This award for the year 2010-11 was conferred on 27.06.2011 for excellent use of Hindi in day to day working of the Centre.

Dr. B. L.Chirinia receiving Nagar Raj Bhasha Appreciation award

Excellence in Sports

ICAR intear-zonal tournament at Kolkatta (16-19 Jan. 2012): The volley ball (shooting) team of the Centre won ICAR championship at Interzonal tournament held at Kolkatta during 16-19 January, 2012. Dr S.K. Ghorui (Chief de mission), Dr Raghvendra Singh (Manager), Sarva shri Mohan Singh Chowhan (Captain), K.P. Sharma, Ashok Kumar, Anil Kumar Jajoria, Jamil Ahmed Mugal, Mahendra Kumar Rao, Prabhu Dayal Joyiya, Nemi Chand Barasa and Vishnu Kumar were the team members. Shri Mohan Singh Chowhan won Gold in Discuss throw and bronze in Shot put competition in this tournament.

33rd National Masters Athletics Championship: Shri Mohan Singh also won second prize in Shot put in 33rd National Masters Athletics Championship held at Bangaluru during 23-26 February, 2012.

ICAR Zonal Tournament at CAZRI, Jodhpur (13-17 Feb. 2012): The volleyball (shooting) team of the Centre became winner. The badminton team (Drs N.V. Patil, Raghvendra Singh, Sarva shri Ashok Yadav, Anil Kumar and K.K. Yadav) also became winner. Shri Mohan Singh won 1st position in Shotput and Discuss throw. Dr (Mrs.) D. Suchitra Sena became winner in Chess (women). The contingent of the Centre also won the Fair Play trophy for the tournament.

Staff of the Centre celebrating new year 2.1.2012

Dr Mohan Bhagwat, Vet. Pathologist in the laboratory during visit to Centre

Volleyball team became winner of ICAR Zonal tournament at CAZRI, Jodhpur

Contingent of the Centre won fair play trophy at ICAR Zonal tournament at CAZRI, Jodhpur

Dr B.S. Prakash ADG (AN&P) visited the Centre

Badminton team won the first prize at ICAR Zonal tournament at CAZRI, Jodhpur

12. Personnel

Director

Dr. N.V. Patil

Principal Scientist

1. Dr. S. K. Ghorui, Veterinary Parasitology
2. Dr. S. C. Mehta, Animal Genetics & Breeding
3. Dr. A. K. Nagpal, Animal Nutrition
4. Dr. Sajjan Singh, Animal Physiology

Senior Scientist

1. Dr. A. K. Roy, Animal Physiology (Transferred to NDRI, Karnal in May, 2011)
2. Dr. Sumant Vyas, Animal Reproduction
3. Dr. Raghvendra Singh, Animal Bio-Chemistry (Joined back from deputation in May, 2011)
4. Dr. F. C. Tuteja, Veterinary Medicine
5. Dr. Gorakh Mal, Animal Bio-Chemistry
6. Dr. C. Bhakat, Livestock Production Management
7. Dr. (Mrs.) D. Suchitra Sena, Veterinary Medicine
8. Dr. (Mrs.) Nirmala Saini, Animal Nutrition
9. Dr. U.K. Bissa, Animal Genetics & Breeding

Scientist

1. Dr. G. Nagarajan, Animal Bio-technology
2. Dr. Sanjay Kumar, Veterinary Parasitology (on study leave)
3. Dr. Narnaware Shirish Dadarao, Veterinary Pathology
4. Dr. Devendra Kumar, Livestock Products Technology
5. Dr. Shyam Singh Dahiya, Veterinary Microbiology
6. Dr. G. Sivakumar, Veterinary Parasitology

Technical Officer

1. Dr. N. Sharma, LSF, T-9
2. Sh. Ram Kumar, Farm Manager, T-9
3. Dr. B. L. Chirania, Sr. Veterinary Officer, T-9
4. Sh. Kashi Nath, Veterinary Officer, T-6
5. Sh. Ram Dayal Raigar, Technical Officer, T-6
6. Sh. Dinesh Munjal, Technical Officer, T-6
7. Sh. M. K. Rao, Technical Officer, T-5
8. Sh. Nand Kishore, Technical Officer, T-5
9. Sh. Mohan Singh, Technical Officer, T-5
10. Sh. Nemi Chand, Technical Officer, T-5
11. Sh. Manjeet Singh, Technical Officer, T-5
12. Sh. Ram Chandra, Technical Officer, T-5

Administration

1. Sh. V.K. Pandey, Admin. Officer (Joined on 22 Feb.2012)
2. Sh. K. P. Sharma, Asstt. Admin. Officer
3. Sh. Ram Kumar, P.S.

13. Infrastructure Development

Pasteurization plant

In view to produce pasteurized camel milk for human consumption, a Skid Mounted High Temperature Short Time (HTST) Milk Pasteurizer plant having capacity of 50 lit/h was installed.

Spray dryer with concentration facility

For the production and evaluation of camel milk powder, a laboratory model Spray Dryer with concentration facility (Yamato, Japan) was installed.

Lactoscan (Milk analyzer)

Lactoscan was installed for the quick scanning of camel and other species milk for different parameters viz., temperature, fat, solids-not-fat, lactose, protein, acid soluble ash, conductivity, pH, freezing point and added water.

Guest House Extension

For providing good accommodation and other facilities, ICAR, New Delhi has approved the extension of guest house of the centre. In this regard, on 29th December 2011 Prof. KML Pathak, DDG(AS) laid foundation stone for building.

Other related works:

- Renovation of animal nutrition laboratory is in the stage of completion.
- The construction of foundation and fixing of poles for two high mast lights are awarded to CPWD and the work is in progress.
- The finishing work of community centre is in progress and the work is likely to be completed

by CPWD.

- A feed store was constructed to keep and store raw materials for preparation feed pellets for camel.
- A new pump house room was constructed near for newly dug well and the said room is ready to use.
- Shed was constructed to protect the feed pelleting machine from rain, dust & sun light etc.

Bhumipujan of guest house by Hon'ble Prof. KML Pathak, DDG (AS) on 29/12/11

14. केन्द्र की राजभाषा संबंधी गतिविधियाँ

हिन्दी सप्ताह, 2011

हिन्दी दिवस, 2011 के शुभ उपलक्ष्य पर राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर में दिनांक 13-19 सितम्बर तक हिन्दी सप्ताह मनाया गया। केन्द्र निदेशक डॉ. नितीन वसन्तराव पाटिल द्वारा हिन्दी सप्ताह मनाए जाने की विधिवत् घोषणा की गई।

केन्द्र में हिन्दी सप्ताह के शुभारम्भ पर राजभाषा इकाई प्रभारी डॉ. बिहारी लाल चिरानियाँ द्वारा हिन्दी दिवस मनाए जाने की परंपरा के सन्दर्भ में सभी को अवगत करवाते हुए केन्द्र को राजभाषा के क्षेत्र में प्राप्त उपलब्धियों एवं गतिविधियों पर प्रकाश डाला गया। हिन्दी दिवस की पूर्व संध्या पर आयोजित इस कार्यक्रम में केन्द्र निदेशक डॉ. नितीन वसन्तराव पाटिल ने कहा कि हिन्दी दिवस पर रखे जाने वाले सभी कार्यक्रम हिन्दी को बढ़ावा देने के लिए आयोजित किये जाते हैं। इनसे हमें हिन्दी में अधिकाधिक कार्य करने की प्रेरणा मिलती है। डॉ. पाटिल द्वारा अन्तरमन से मनन कर हिन्दी में कार्य शुरू कर करने हेतु प्रोत्साहित किया गया।

श्रीमान शरद पवार, माननीय कृषि उपभोक्ता मामले, खाद्य और सार्वजनिक वितरण मंत्री, भारत सरकार द्वारा हिन्दी दिवस, 2011 संबंधी प्राप्त प्रेरणाप्रद संदेश को केन्द्र के मुख्य भवनों पर लगाया गया। इस अवसर पर सर्वप्रथम माननीय महानिदेशक डॉ.एस.अय्यप्पन, भारतीय कृषि अनुसंधान परिषद, नई दिल्ली की ओर से हिन्दी दिवस, 2011 के अवसर पर जारी अपील को पढ़कर सुनाया गया।

प्रतियोगिताएं एवं पुरस्कार विजेता

(1) हिन्दी में आशुभाषण प्रतियोगिता-प्रथम चरण

केन्द्र के कार्मिकों में अभिव्यक्ति कौशल एवं राजभाषा हेतु उपयुक्त वातावरण के सृजन के प्रयोजन को ध्यान में रखते हुए प्रथम चरण में आयोजित इस प्रतियोगिता में निर्णायक के रूप में डॉ. शिवराज छंगाणी, साहित्यकार, बीकानेर एवं डॉ. मधु अग्रवाल, विभागाध्यक्ष, महारानी सुदर्शना कन्या महाविद्यालय, बीकानेर को आमंत्रित किया गया।

विजेता प्रतिभागी (वैज्ञानिक एवं तकनीकी वर्ग)

प्रथमः डॉ. राघवेन्द्र सिंह, द्वितीयः डॉ.चंपक भकत,
तृतीय : (1) डॉ. शरत चन्द्र मेहता (2) डॉ. निर्मला सैनी
प्रोत्साहन पुरस्कार : श्री दिनेश मुंजाल

(2) हिन्दी में आशुभाषण प्रतियोगिता-द्वितीय चरण

इस प्रतियोगिता में निर्णायक मंडल के रूप में भारतीय जीवन बीमा निगम, बीकानेर की पूर्व राजभाषा अधिकारी श्रीमती संगीता सेठी एवं केन्द्रीय विद्यालय, बीकानेर से हिन्दी व्याख्याता डॉ.चन्द्र प्रकाश यादव को आमन्त्रित किया गया।

केन्द्र में आशुभाषण प्रतियोगिता

विजेता प्रतिभागी (प्रशासनिक एवं शेष तकनीकी वर्ग)

प्रथम : श्री अनिल कुमार, द्वितीय : श्री सतनाम सिंह
तृतीय : श्री हरपाल सिंह, प्रोत्साहन : श्री कंवर पाल शर्मा

विजेता प्रतिभागी (सहायक कर्मचारी वर्ग)

प्रथम : श्री नेताराम, द्वितीय : श्री दुर्गासिंह,
तृतीय : श्री माणक लाल

(3) हिन्दी में श्रुति लेखन प्रतियोगिता (सभी वर्गों हेतु)

प्रथम : श्री हरपाल सिंह, द्वितीय : डॉ.बलदेव दास किराड़ू, तृतीय : श्री सुखदेव प्रजापत,
प्रोत्साहन : श्री राधाकृष्ण

(4) राजभाषा कार्यशाला

केन्द्र में हिन्दी सप्ताह के दौरान राजभाषा कार्यशाला का आयोजन किया गया। राजभाषा कार्यशाला की मुख्य वक्ता राजकीय डूँगर महाविद्यालय, बीकानेर की डॉ. शालिनी मूलचंदानी, वरिष्ठ व्याख्याता, हिन्दी विभाग ने **सहज एवं सरल हिन्दी,** विषयक व्याख्यान पर बोलते हुए कहा कि हिन्दी हमारे चिंतन को व्यक्त करती है, यह हमारी संवेदनाओं को जगाती है। मनुष्य के चित्त की गहराई भाषा द्वारा ही ज्ञात की जा सकती है। भारत के महान विद्वानों ने हिन्दी को अपना कर साहित्य की रचना की। अतिथि वक्ता ने कहा कि वैज्ञानिक युग में हिन्दी की उपादेयता समाप्त नहीं हुई है। वैश्वीकरण के दौर में आज परिस्थितियाँ बदल गई है और समस्त टी.वी.चैनलों, सिनेमा एवं एफ. एम.रेडियो इत्यादि में आज यह भाषा एक आवश्यकता के रूप में ऊभर कर सामने आ रही है।

(5) हिन्दी सप्ताह : पुरस्कार वितरण-समापन समारोह

केन्द्र में आयोजित हिन्दी सप्ताह का पुरस्कार वितरण-समापन समारोह के मुख्य अतिथि डॉ. एस.के. शर्मा, निदेशक, केन्द्रीय शुष्क बागवानी संस्थान, बीकानेर ने कहा कि भारत देश को विश्व गुरू के रूप में देखा जाता रहा है। भारत विविधता वाला देश है जहां विभिन्न भाषाएं एक साथ विचरण करती है। राष्ट्र समृद्धि हेतु हमें हिन्दी भाषा अपनानी होंगी। उन्होंने कहा कि ज्ञान की कोई सीमा नहीं है, हमें केवल सोच बदलने की आवश्यकता है। अतः हिन्दी को पूरे मनोयोग से अपनाने की महत्ती आवश्कता है।

डॉ. शालिनी मूलचंदानी, वरिष्ठ व्याख्याता, हिन्दी विभाग, राजकीय डूँगर महाविद्यालय, बीकानेर

मुख्य अतिथि डॉ. एस.के. शर्मा, निदेशक, केन्द्रीय शुष्क बागवानी संस्थान, बीकानेर

समापन समारोह के विशिष्ट अतिथि डॉ. एन.डी. यादव, अध्यक्ष, केन्द्रीय शुष्क अनुसंधान संस्थान, क्षेत्रीय केन्द्र, बीकानेर ने कहा कि हिन्दी को विज्ञान की भाषा में व्यक्त करना थोड़ा मुश्किल है लेकिन इस दिशा में सतत प्रयास जारी रहने चाहिए। हिन्दी में प्रत्येक भाषा के शब्द हैं अतः हमें हिन्दी में सोचते हुए इसे प्रयोग में लाना चाहिए। डॉ. यादव ने स्पष्ट किया कि आज से 200 साल बाद भी आध्यात्म विज्ञान की जानकारी हेतु हिन्दी की आवश्यकता होगी।

समापन समारोह की अध्यक्षता करते हुए केन्द्र निदेशक डॉ.नितीन वसन्तराव पाटिल ने अपने अभिभाषण में केन्द्र के विजेता प्रतिभागियों को बधाई देते हुए कहा कि हम हिन्दी को बोलचाल की भाषा के रूप में प्रयुक्त करते हैं

तो उसे पूर्णतया कार्यरूप में लेने का भी प्रयास किया जाना चाहिए। अध्यक्ष महोदय ने हिन्दी भाषा को आज की महत्ती आवश्यकता बताते हुए कहा कि अनुसंधान का लाभ किसानों, ऊँट पालकों, ग्रामीणों एवं जरूरतमंदों तक पहुँचाना है तो हमें प्रसार-प्रचार की भाषा के रूप में हिन्दी को अपनाना होगा जिससे हमारे अनुसंधान कार्यों की सार्थक सिद्ध हो सके।

इस महत्वपूर्ण अवसर पर भा.कृ.अनु.प. की विषय धुन (थीम सोंग) सुनाई गई तथा अतिथियों एवं केन्द्र कार्मिकों द्वारा केन्द्र के प्रक्षेत्र में वृक्षारोपण भी किया गया। कार्यक्रम का संचालन श्री नेमीचन्द ने किया। धन्यवाद प्रस्ताव प्रभारी राजभाषा डॉ.बिहारी लाल चिरानियां ने प्रस्तुत किया।

राजभाषा कार्यशालाः दिनांक : 25.06.2011

केन्द्र में आयोजित वर्ष की द्वितीय कार्यशाला में अतिथि वक्ता के रूप में पधारे डॉ. श्रीलाल मोहता, साहित्यकार, बीकानेर द्वारा **पत्र-पत्रिकाओं में हिन्दी लेखन** विषयक व्याख्यान प्रस्तुत किया गया। उन्होंने कहा कि कहानी, उपन्यास, संस्मरण, कविता, रेखाचित्र आदि किसी भी विधा के माध्यम से अपना अनुभव बांट कर आप लेखन की शुरूआत कर सकते हैं। ये विधाएं हमारे व्यक्तित्व को परिलक्षित करती हैं। आप अपने अनुभवों को आलेख के रूप में लिख सकते हैं। यदि झिझक को मिटाते हुए लेखन को अभ्यास में लाएंगे तो आपकी भाषा स्वतः ही साहित्यिक बनती चली जाएगी। डॉ.मोहता ने कार्यालय टिप्पण हेतु कार्मिकों को यह सुझाव दिया कि टिप्पण की भाषा सरल, सहज, स्पष्ट व आकर्षक होनी चाहिए। टिप्पण लिखते समय सोच, हिन्दी में होनी आवश्यक है। परिणामस्वरूप टिप्पण की भाषा अधिक प्रभावी होगी। कार्यशाला में उपस्थित प्रतिभागियों द्वारा व्यक्त जिज्ञासाओं का उचित निराकरण किया गया।

राजभाषा कार्यशाला में डॉ. श्रीलाल मोहता, साहित्यकार, बीकानेर

कार्यशाला में अध्यक्षीय उद्‌बोधन में केन्द्र निदेशक डॉ. नितीन वसंतराव पाटिल ने कहा कि ऊँट पालकों एवं किसानों के पास उनके अनुभव के आधार पर उपलब्ध ज्ञान को आज सहेजने की आवश्यकता है। इसे वैज्ञानिक एवं तकनीकी आधार पर जांचा जाए तो परिणाम और अधिक बेहतर प्राप्त होंगे और आमजन इससे लाभान्वित होगा। डॉ.पाटिल ने कहा कि अनुभवी व प्रेरणादायी महान विद्वानों का सान्निध्य निश्चित रूप से एक स्वस्थ समाज की रचना करने में सहायक हैं। इनसे व्यक्ति अपने दैनन्दिन शैली में महत्वपूर्ण बदलाव ला सकता है। उन्होंने कहा कि कार्यशाला, संगोष्ठी आदि महत्वपूर्ण अवसरों के माध्यम से हम परस्पर अपने अनुभव बांट सकते हैं। कार्यशाला के इस अवसर पर केन्द्र के प्रधान वैज्ञानिक डॉ.सज्जन सिंह एवं डॉ.अशोक नागपाल, वरिष्ठ वैज्ञानिक डॉ.सुमन्त व्यास, सहायक प्रशासनिक अधिकारी श्री कंवर पाल एवं डॉ.बलदेव किराडू आदि ने भी अपने विचार व्यक्त किए। कार्यशाला का संचालन प्रभारी राजभाषा डॉ.बिहारी लाल चिरानियां द्वारा किया गया।

राजभाषा कार्यशाला : दिनांक 23.11.2011

केन्द्र में वर्ष की अंतिम राजभाषा कार्यशाला (तृतीय हिन्दी सप्ताह, 2011 के दौरान आयोजित) में अतिथि वक्ता के रूप में डॉ.आई.एस.बंसल, वरिष्ठ चिकित्सक एवं प्रशिक्षक,

सहज ध्यान योग केन्द्र, नई दिल्ली द्वारा **योग द्वारा पाएं स्वस्थ तन एवं मन** विषयक व्याख्यान में कहा गया कि सहज योग के माध्यम से आधुनिक जीवन शैली में अपने आप को निरोग एवं तनाव रहित जीवन जीने, कार्य क्षमता में सुधार लाने, याददाश्त एवं एकाग्रता बढ़ाने, नशा मुक्ति आदि के बारे में आध्यात्मिक एवं वैज्ञानिक विधि द्वारा जानकारी दी जाती है। डॉ.बंसल ने कहा कि सृष्टि में विद्यमान पंच तत्वों - आकाश, धरती, वायु, अग्नि, जल को व्यक्ति साक्षी मानते हुए सहज योग की सरल क्रियाओं द्वारा न केवल स्वयं अपनी चिकित्सा कर सकता है अपितु सम्पर्क में आने वाले अस्वस्थ व्यक्ति, पशु आदि को भी स्वस्थ कर सकता है।

कार्यशाला कार्यक्रम के अध्यक्ष डॉ. नितीन वसन्तराव पाटिल ने अपने अभिभाषण में कहा कि स्वस्थ जीवन शैली अपनाने संबंधी ऐसे कार्यक्रम अत्यंत महत्वपूर्ण है क्योंकि हमारे द्वारा निष्पादित प्रत्येक कार्य पर शारीरिक अवस्था का प्रभाव निश्चित रूप से देखा जा सकता है। डॉ. पाटिल ने आगे कहा कि प्रत्येक व्यक्ति के जीवन में संतुलन स्थापित होना परम आवश्क है। संतुलन आने से व्यक्ति विशेष अपितु उस पूरे संस्थान एवं कार्यस्थल को इसका लाभ मिलता है। उन्होंने कहा कि भौतिकवादी इस युग में हर व्यक्ति किसी न किसी रोग से ग्रस्त है। ऐसे में प्रत्येक व्यक्ति अपने जीवन को अमूल्य निधि मानते हुए सहज योग को रोज अभ्यास में लाएं और स्वस्थ रहे।

कार्यशाला के इस महत्वपूर्ण अवसर पर डॉ.आर.सी. जखमोला, अध्यक्ष, केन्द्रीय भेड़ एवं ऊन अनुसंधान केन्द्र, बीकानेर, डॉ. एन.डी. यादव, अध्यक्ष केन्द्रीय शुष्क क्षेत्र अनुसंधान संस्थान, बीकानेर, डॉ. यशपाल शर्मा, राष्ट्रीय अश्व अनुसंधान केन्द्र, बीकानेर सहित इन संस्थानों के विभिन्न कार्मिकों ने शिरकत की। कार्यशाला में प्रतिभागियों की ओर से केन्द्र के डॉ.सुमन्त व्यास, वरिष्ठ वैज्ञानिक ने भी अपने विचार रखे तथा सभी अतिथियों, अतिथि वक्ता, प्रतिभागियों एवं आगंतुको का धन्यवाद ज्ञापित किया। कार्यक्रम का संचालन श्री नेमीचन्द ने किया।

राजभाषा कार्यशाला : दिनांक 15.03.2012

राजभाषा नीति कार्यान्वयन के अन्तर्गत राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर द्वारा दिनांक 15.03.2012 को केन्द्र के समिति कक्ष में **कम्प्यूटर पर यूनिकोड के प्रयोग** विषय पर आयोजित एक दिवसीय राजभाषा कार्यशाला में कम्प्यूटर पर यूनिकोड प्रणाली द्वारा हिन्दी में कार्य करने संबंधी प्रशिक्षण-व्याख्यान सत्र रखे गए। कार्यशाला में प्रशिक्षक के रूप में श्री प्रदीप कुमार, अधीक्षक, राजभाषा, उत्तर पश्चिम रेलवे, मंडल कार्यालय, बीकानेर को आमंत्रित किया गया। व्याख्यान-प्रशिक्षण हेतु अतिथियों के रूप में श्री प्रेम प्रकाश पारीक, तकनीकी अधिकारी एवं प्रभारी राजभाषा एवं श्री भोजराज, टी-4 (कम्प्यूटर), केन्द्रीय शुष्क बागवानी संस्थान, बीकानेर द्वारा **कम्प्यूटर पर सहज है हिन्दी भाषा में कामकाज** विषयक व्याख्यान प्रस्तुत किया गया।

राजभाषा कार्यशाला

प्रभारी राजभाषा डॉ. बिहारी लाल चिरानियां द्वारा कार्यशाला के उद्देश्य एवं महत्व पर प्रकाश डालते हुए कहा कि आयोजित कार्यशाला के माध्यम से कम्प्यूटर पर हिन्दी कार्य के अधिकाधिक प्रयोग को बढ़ावा दिए जाना हमारा मुख्य प्रयोजन है। आशा है कि हमारे वैज्ञानिक, अधिकारी एवं कर्मचारी गण इससे लाभान्वित होंगे।

केन्द्र में **कम्प्यूटर पर यूनिकोड के प्रयोग** विषयक राजभाषा कार्यशाला के इस अवसर पर प्रतिभागियों को श्री प्रदीप कुमार द्वारा कम्प्यूटर पर यूनिकोड के प्रयोग संबंधी महत्वपूर्ण जानकारी देते हुए कम्प्यूटर में इस प्रोगाम

को इंस्टॉल करने, अलग-अलग फॉन्ट में कार्य करते हुए यूनिकोड कनवर्टर को प्रयुक्त करने, कम्प्यूटर पर शब्दिका जैसे लघु सॉफ्टवेयर का प्रयोग कर शब्दावली की सहायता प्राप्त करने, एरियल यूनिकोड एक अन्तर्राष्ट्रीय फॉन्ट द्वारा डिस्प्ले में समानता लाए जाने तथा की-बोर्ड द्वारा भाषा परिवर्तन संबंधी महत्वपूर्ण एवं व्यावहारिक जानकारी कम्प्यूटर के माध्यम से प्रदान की।

इस राजभाषा कार्यशाला में श्री प्रेम प्रकाश पारीक द्वारा **कम्प्यूटर पर सहज है हिन्दी भाषा में कामकाज** विषयक व्याख्यान प्रस्तुत करते हुए कहा कि अब कम्प्यूटर पर कार्य करना अत्यंत आसान है तथा इसके लिए दृढ़ इच्छाशक्ति का होना आवश्यक है। आज कम्प्यूटर पर यूनिकोड, गुगल आदि के माध्यम से कार्य करना सरल हो गया है तथा विभिन्न वेबसाइटों पर निःशुल्क सॉफ्टवेयर आदि उपलब्ध है। श्री पारीक द्वारा भारतीय कृषि अनुसंधान परिषद की ओर से राजभाषा के प्रगामी प्रयोग हेतु द्विभाषी प्रकाशनों संबंधी बात भी रखी। कार्यशाला के व्याख्यान-प्रशिक्षण सत्र की इसी कड़ी में श्री भोजराज द्वारा राजभाषा विभाग की ओर से विकसित हिन्दी में कार्य करने के लिए सहायक सॉफ्टवेयर, विभिन्न हिन्दी वेबसाइट, ऑनलाइन शब्द कोश, गुगल डिक्शनरी, ई-महाशब्दकोश, मशीन अनुवाद, गुगल अनुवाद आदि विभिन्न महत्वपूर्ण जानकारी पॉवर पाईन्ट के माध्यम से दीं।

इस अवसर पर केन्द्र निदेशक एवं कार्यक्रम अध्यक्ष डॉ. नितीन वसंतराव पाटिल ने अपने अभिभाषण में कहा कि आयोजित कार्यशाला निश्चित रूप से एक सार्थक प्रयास रहा तथा सभी वैज्ञानिको, अधिकारियों एवं कर्मचारियों ने अतिथि वक्ताओं द्वारा कम्प्यूटर पर हिन्दी प्रयोग संबंधी महत्वपूर्ण जानकारी का लाभ लिया है, आवश्यकता इस बात की है कि इसे अपने कार्यक्षेत्र में प्रयुक्त करते हुए और अधिक हिन्दी में कार्य करने हेतु सक्षम बनें, इसे रोजमर्रा की कार्यशैली में अपनाएं, इससे निश्चित रूप से लाभ होगा तथा इससे राजभाषा के उत्तरोत्तर विकास का मार्ग भी प्रशस्त होगा। अपने अभिभाषण के अंत में उन्होंने राजभाषा विभाग द्वारा जारी निर्धारित लक्ष्यों की पूर्ति हेतु प्रतिभागियों को प्रोत्साहित किया। कार्यशाला का संचालन नेमीचन्द बारासा, तकनीकी अधिकारी द्वारा किया गया।

Camel herd in Banswara district in south Rajasthan

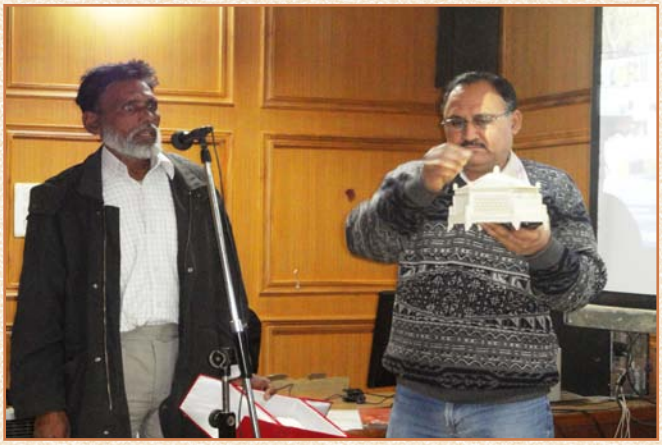
Stake holders sharing experience……

From “sahjeevan” and NGO at Bhuj (Guj)

Farmer from Kachchh (Gujarat)

Camel breeding expert from Leh (J & K)

Farmer from “LPPS” Sadri, Pali (Raj.)



Camel bone artisan from Lucknow (U.P.)

Camel hair weaver from Bikaner (Raj.)