वार्षिक प्रतिवेदन

Annual Report

2012-13

निदेशक–डॉ. एन. वी. पाटिल

Director – Dr. N. V. Patil

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र

(भारतीय कृषि अनुसंधान परिषद्)

पोस्ट बैग–07, जोड़बीड़, बीकानेर–334 001 (राज.), भारत

National Research Centre on Camel

(Indian Council of Agricultural Research)

Post Bag-07, Jorbeer, Bikaner-334 001 (Raj.), India


TAKEN FOR THE CONSERVATI
ACHIEVEMENTS IN CA

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FARMERS TRAINING UNDER ATMA PROJECT

Preface

It gives me a sense of satisfaction to present the account of activities of research, development and administrative achievements for the year 2012-13 in the form of Annual Report of National Research Centre on Camel, Bikaner. The recommendations of Research Advisory Committee helped in targeting the research outcomes 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 Stake Holders, Brain Storming Sessions, Monthly Meetings with the scientists and staff. As a result of team effort of scientists, 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 significant research achievements during the year was better conception rate of 76.19%in farm camels and from field cases the success was in getting successful calvings in 63%of she camels provided with the breeding service.The effort to establish the camel as milch animal was strengthened by working out the milk production potential of the different camel breeds at farm level and deriving prediction equations to know possible milk yield at 10 months of lactation. Better Body condition score (BCS)in most of pregnant and lactating animals indicated better management conditions. In order to assert the benefits of the camel milk the study conducted to know the bioactive properties of fermented camel milk as an antioxidant activity indicated that it was significantly higher in the fermented than in raw camel milk. Its antimicrobial activity was also indicative for the fermented milk as its supernatant was found 100% inhibitory to growth of *E. Coli* at 5% concentration level.

In research on camel health in naturally *T. evansi* infected camels the levels of some enzymes studied indicated damage to hepatic cells and the change in blood glucose which could be possible indirect mean to understand the status of trypanosomiasis affected camel. During village visits by NRCC, 306 ailing cases were attended and samples collected gave accurate diagnostic cum chemotherapy measures.Effective treatment modules for skin candidiasis (thikria) were validated and most effective treatment based on rate of recovery of hair in 7 applications is being advocated.

In biotechnology the TLR-2 gene of dromedary and bactrian camels was amplified, cloned and sequenced. The complete sequence of the Dromedary camel IL-10 revealed that sequence identity at the nucleotide and amino acid level, respectively, with the Bactrian camel and other livestock. Interferon-Gamma gene of the Dromedary was cloned at EcoRI and NotI sites of bacterial expression vector-pET 32 (a) and the recombinant plasmid obtained was named as pETCAMELGAM. The complete nucleotide sequences of the epidermal growth factor (EGF) encoding gene of CMLV from India of size of 418 bp and its nucleotide sequences from India were also compared . Heat shock protein 70 encoding gene (HSPA1B) of the Dromedary camel was amplified from the total cellular RNA isolated from the blood and sequence analysis of Indian Dromedary camel was also compared with different species.

In metagenomic analysis of camel rumen microbiota based on RDP database, in the adult and camel calves group , the phylogenetic distribution revealed abundance

of the Firmicutes followed by bacteroidets, verrucomicrobia and proteobacteria. The genera found in the most abundant phyla of adult camels are a majority of Bacteroides, Clostridium, Bacillus, Eubacterium, Ruminococcus *etc.* and in camel calves they were Clostridium, Ruminococcus, Eubacterium, Treponema, Bacteroides *etc*.

Feeding lactating camels 75% of requirement resulted in significantly lower DMI (7.26 Vs 10.56Kg/d) but feed efficiency was significantly better in group fed 100% compared to group fed 75% of requirement.

Isolation of cellulose specific anaerobic bacteria from faecal samples of adult Bactrian camels was attempted and characterization was done.

Different extension activities were carried out through collaboration with NGOs and 5 exhibitions camps were organized for the benefit of camel farmers. Various activities of centre were also highlighted through organization of Agriculture Education Day and in 5 scientist-farmer-extension interface meets about 80 interested farmers and farm women were provided the training. NRCC was also host for organization of ICAR Zonal sports meet at Bikaner and it was accomplished with the overall support of staff and facilities from all ICAR institutes located in Bikaner.

During the year total allocated budget was utilized and the infrastructure was strengthened by undertaking renovation and some new works and also by procurement of various equipments to strengthen the research facility.

I am happy to see that the dedicated group efforts put in by all the scientists, technical and administrative staff 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. B.C.Patnayak, Ex-Director,CSWRI 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 Hon'ble DG, ICAR for valuable guidance, support and encouragement. I express my sincere gratitude to Dr. K.M.L. Pathak, DDG(AS), ICAR for needful advice, encouragement and corrective support for research and development activities of the Centre. The timely cooperation and valuable guidance received from Dr. B.S. Prakash, ADG(AN&P), Dr. Gaya Prasad, ADG(AH) and 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

This year the herd strength at centre remained about 330 to 350. The conception rate was 76.19%. In the previous year 73 females were given service and out of which 46 were conceived (63%).The mortality was 5.88%.

Average daily milk production (ml/d) from two teats was 2374±16.7 with highest production of 2599±29.3 recorded in Jaisalmeri. The effect of breed, parity and year along with the interactions of breed with year and parity was highly significant . The peak yield (ml/d) at 5th month of lactation it was 3409 . The average lactation yield(l) was 1883±75, 2239±88, 2520±100 and 3017±148 for the lactation length of 10, 12, 14 and 16 months, respectively and respective lactation persistency was 76.20, 67.07, 55.67 and 35.87 %. The animals conceived in next breeding season of the calving had lactation length of 14 to 16 months but which were bred immediately after 30 days or thereafter, had lactation length of about 10 months. The lactation curve was derived. For Prediction of Lactation Yield for 10 months the linear equation was established as Y=106.727+ 238.597(Y_{5m}) where Y_{5m} is peak yield at 5 month.

Six 5' flanking regions of milk protein genes, viz. á-Casein, Lactoperoxidase, Whey Acidic Protein, Lactoferrin, Peptidoglycan RP, á- S1-Casein and â-casein were successfully amplified and characterized.Full length sequencing was carried out and the sequencing was done for k-casein and dendrogram constructed. The k-casein 5' flanking region and partial gene are conserved across dromedary and bactrian camels and sequence homology was about 80% with equines and about 85% with buffalo, sheep and goat.

Body condition score (BCS)in most of pregnant and lactating animals was either 3 or 3.5 attributed to better management conditions. In a field study the effect of ploughing on haematological and blood biochemical parameters in both adult male and female work camels was observed.

The bioactive properties of fermented camel milk as an antioxidant activity was significantly higher in the fermented than in raw milk. The antimicrobial activity against *E. Coli* of fermented milk supernatants was found 100% inhibitory at 5% concentration level.

From enzymes studied in naturally *T. evansi* infected camels, damage to hepatic cells and the change in blood glucose was evident. In 31 village visits total 306 cases attended and samples collected revealed bacterial infections with *Staphylococcus aureus* from mastitis and from skin infections fungi revealed were *Microsporum nanum*, *M. canis*, *Trichophyton verrucosum*, *T. soudanense, Candida albicans* and *Aspergillus* spp.

Effective treatment of skin candidiasis (thikria) was validated by using 2% potassium iodide in distilled water(T1),or 6% sulphur (80% sulphur in mustard oil (*Brassica* spp.)(T2)or on 1st day washing lesions with sodium thiosulphate (10%) solution and followed by application of 6% sulphur (80% sulphur) and 3% salicylic acid in mustard oil (*Brassica* spp.)(T3).T3 was found more effective based on rate of recovery of hair in 7 applications.

The TLR-2 gene of dromedary and bactrian camel was amplified, cloned and sequenced. The complete sequence of the dromedary camel IL-10 and its comparison to corresponding amino acid sequences from six other mammalian sequences as well as four other PPV revealed that the open reading frame (ORF) of Dromedary camel IL-10 is 537 bp in length, encoding a length of polypeptide with 178 amino acids. Sequence analysis revealed that the Dromedary camel shared 99.4% and 98.3% sequence identity at the nucleotide and amino acid level, respectively, with the bactrian camel.

On the other hand, Ilama showed 99.0% and 97.1% sequence identity at the nucleotide (nt) and amino acid (aa) level, respectively. With cattle, the dromedary camel shared 87.8% and 84.2% sequence identity at the nucleotide and amino acid level, respectively. The dromedary camel IL-10 exhibited 62.6% and 68.5% sequence identity at the nucleotide and amino acid level, respectively, with vIL-10 from camel.

A phylogenetic tree constructed based on amino acid sequences of IL-10 gene of common livestock species and parapoxvirus species indicated that the three camelid species viz. the dromedary camel, the bactrian camel and Ilama are forming a cluster.

Interferon-Gamma gene of the dromedary was cloned at EcoRI and NotI sites of bacterial expression vector-pET 32 (a) and the recombinant plasmid obtained was named as pETCAMELGAM. It was expressed as a fusion protein of 38kDa size.The complete nucleotide sequences of the epidermal growth factor (EGF) encoding gene of CMLV from India has the size of 418 bp in this there is an addition of one cytosine residue at position 132. Due to this mutation, as expected, the resultant protein was a truncated polypeptide. The nucleotide sequences of the EGF encoding gene of CMLV obtained from India showed 98.8% identity with both CMLV-Kazakhstan and CMLV-Iran strains, which was further confirmed by phylogenetic analysis. Similarly, the complete amino acid sequences of golgi anti apoptotic protein (GAAP) encoding gene (obtained through sequencing) and its relation to GAAP gene of other orthopox viruses indicated it was 714 bp in length, encoding 237 amino acids. Both the nucleotide and deduced amino acid sequences of this gene showed 99.5% identity with CMLV-Kazakhstan, which was further confirmed by phylogenetic analysis .

The open reading frame (ORF) of IL-10 from camel parapoxvirus is 561 bp, encoding 187 amino acid polypeptide. The first third of the amino terminal of the proteins exhibits the variation whereas the carboxy terminal portion of the proteins possesses the conserved regions. Comparison of the sequences of vIL-10 from camel with the corresponding sequences of seven farm animal species and three PPVs available in the database revealed that vIL-10 from camel shared 84.7% and 83.4 % sequence identity at the nucleotide and amino acid level, respectively, with vIL-10 from reindeer. With camelids, PCPV- camel showed 62.5-62.8% and 68.0-68.5% sequence identity at the nucleotide and amino acid level, respectively. Among the artiodactyles, cattle shared highest sequence identity with vIL-10 from camel, i.e. 63.1% and 72.2 % sequence identity at the nucleotide and amino acid level, respectively.

Similarly, the dsRNA binding protein (RBP) encoding gene of parapoxviruses (PPVs) from the Dromedary camels, from different region of Rajasthan, amplified by using the primers of pseudocowpoxvirus (PCPV) from Finnish reindeer and cloned into pGEM-T for sequence analysis revealed that PPV DNA from Bikaner shared 98.3 % and 76.6 % sequence identity at the amino acid level, with Pali and Udaipur PPV DNA, respectively. Reference strains of bovine papular stomatitis virus (BPSV) and PCPV (reindeer PCPV and human PCPV) shared 52.8 % and 86.9 % amino acid identity with RBP gene of camel PPVs from Bikaner, respectively. But different strains of orf virus (ORFV) from different geographical areas of the world shared 69.5-71.7 % amino acid identity with RBP gene of camel PPVs from Bikaner. This indicates that the camel PPVs described are closely related to bovine PPV (PCPV) in comparison to caprine and ovine PPV (ORFV).

The gene sequences of Heat shock protein 70 encoding gene (HSPA1B) of the Dromedary camel were amplified from the total cellular RNA isolated from the blood. The open reading frame of HSP 70 gene obtained from Indian Dromedary camel is 1926 bp and encodes a polypeptide of 641 amino acids. Sequence analysis of HSP 70 gene revealed that the Indian Dromedary

camel shared 99.3 % identity at the amino acid level with humped cattle (*Bos indicus*) and buffalo. Dromedary camel from Russia cattle (*Bos taurus*), sheep and horse shared 99.2 % identity at the amino acid level with the Indian Dromedary camel.A phylogenetic tree constructed based on the amino acid sequences of HSP A1B of different livestock species and human.

Based on RDP database, in the adult and camel calves group , the phylogenetic distribution revealed abundant hits were for the Firmicutes followed by bacteroidets, verrucomicrobia and proteobacteria. The genera found in the most abundant phyla of adult camels are a majority of Bacteroides, Clostridium, Bacillus, Eubacterium, Ruminococcus *etc.* and in camel calves they were Clostridium, Ruminococcus, Eubacterium, Treponema, Bacteroides *etc*.

The functional hierarchies in adult camels clustering based subsystems followed by carbohydrates, virulence, disease and defence showed more than 10 % abundance whereas in camel calves DNA metabolism, RNA metabolism, Metabolism of Aromatic amino-acids, clustering based systems showed more than 10 % abundance. Comparative percent functional hierarchy in adult camels and camel calves based on COG's and KO was also studied.

Feeding lactating camels 75% of requirement resulted in significantly lower DMI (7.26 Vs 10.56Kg/d) and also resulted in lower weight gain, milk yield but feed efficiency was significantly better in group fed 100% compared to group fed 75% of requirement.

The growth of calves, born to females of the two group were maintained on dam's milk and feed pellets was similar.

From faecal samples of adult Bactrian camels, isolation of cellulose specific anaerobic bacteria was attempted and characterization was done based on gram's staining and morphology and Sugar utilization tests were performed. All the isolates were able to utilize most sugars, showed positive test for catalase, gas production and showed negative motility,except 4 and except 3 all were negative for gelatin liquefacation test.

In dromedary calves maintained on sole guar phalgati bacterial isolation from rumen liquor was done for 18 isolates and characterization based on gram's stain and morphology was done and sugar utilization tests indicated that all the 18 bacterial isolates were able to utilize most sugars .The average daily gain and total body weight gain in calves sent for grazing during relatively cool parts of day was significantly higher compared to calves sent as per routine farm schedule i.e. during morning through late afternoon hours.

Different extension activities were carried out through collaboration with NGOs and 5 exhibitions camps were organized for the benefit of camel farmers.Various activities of centre were also highlighted through organization of Agriculture Education Day and 5 scientist-farmer-extension interface meets were conducted .In addition for about 80 interested farmers and farm women, the training programmes were organized.

2. Introduction

Brief History

The National Research Centre on Camel came into being on July 5th, 1984 as a Project Directorate on Camel under Indian Council of Agricultural Research. 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.

Research Laboratory Building

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 Time zone: 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:

1. To undertake basic and applied research for improvement of camel

2. To provide leadership and co-ordinate camel research and training nationally and act as a national repository of information and

3. 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

Since its inception, the excellent infrastructure facilities have been developed including modern laboratories, library, visitor's room, museum ,Agricultural farm , central instrumentation facility, milk parlour , Camel dairy 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 products technology.

The centre maintains an elite herd of about 330 to 350 camels comprising of Bikaneri, Jaisalmeri, Kachchhi and Mewari breeds. In agriculture section of centre one thousand new plants seedlings of fodder trees were introduced to strengthen silvi-pasture system and fodder resources. Rangeland, silvi-pasture and cultivated fodder crops supported grazing about 300 camels per day

Staff Position (as on March 31, 2013)

S.N.	Designation	Sanctioned Post	Post Filled	Posts Vacant
	Scientific posts			
1	Director (RMP)	01	01	00
2	Principal Scientist	03	03	00
3	Senior Scientist	06	02	04
4	Scientist	14	11	03
	Technical posts			
1	T – 6	04	04	NIL
2	T – 3	08	08	NIL
3	T – 2	02	02	NIL
4	T – 1	10	10	NIL
	Administrative posts			
1	Administrative Officer	01	01	NIL
2	Asstt. Adm. Officer	01	01	NIL
3	Asstt. Fin. & Acc. Officer	01	01	NIL
4	Personal Secretary	01	01	NIL
5	Personal Assistant	01	01	NIL
6	Office Assistant	04	03	01
7	Upper Divisional Clerk	01	01	NIL
8.	Lower Divisional Clerk	02	NIL	02
	TOTAL	**12**	**09**	**03**
	Skilled Support Staff posts			
1	Skilled Support Staff	18	18	NIL
	TOTAL	**18**	**18**	**NIL**

around the year and about 1100 quintals green fodder, 50 quintals of dry fodder were supplied for stall feeding and 27.38 quintal guar grain was also produced. The library subscribes to 10 Indian and 12 foreign journals and has a collection of 7862 reference books.

The centre 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.

The total staff strength is 78 including scientist, technical, administrative, skilled support staff.

Financial statement (2012-13)

The optimal utilization of funds allocated to the Centre was ensured during the year and actual utilization of the budget under plan, non-plan included revenue and externally funded projects head was as under during the year 2012-13.

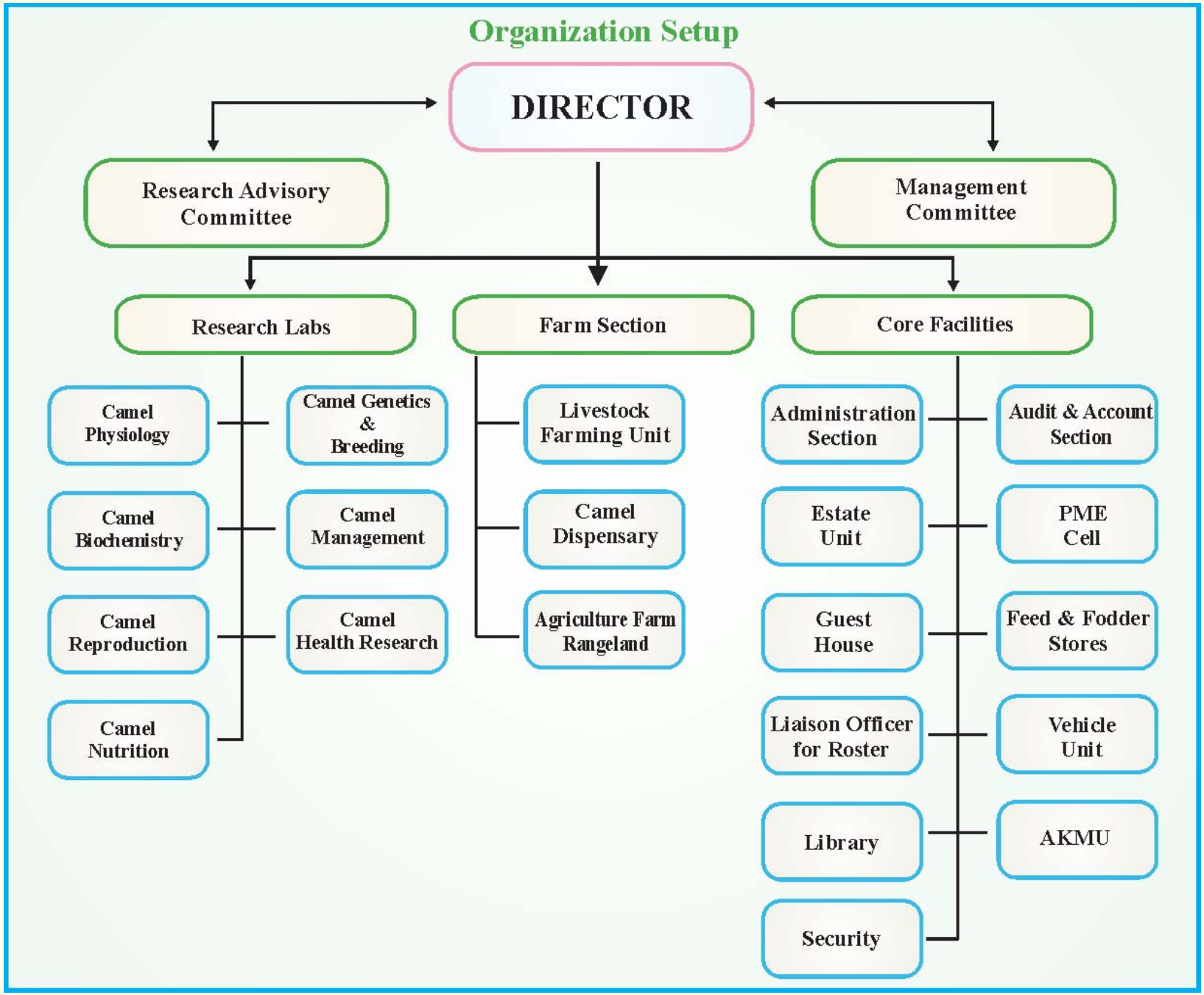
Budget for non plan and revenue receipt (2012-13) **(Rs. Lakhs)**

EXPENDITURE STATEMENT UPTO 31.03.2013

S N	Head	Non Plan	
		RE 2012-13	Expd.
1 (a)	Establishment Expd	483.27	475.55
(b)	OTA	0.20	0.18
(c)	Wages	49.73	49.72
2	Traving Allowance	1.50	1.50
3	HRD	0.00	0.00
4	Other Charges	9.00	8.99
5	Livestock	0.00	0.00
6	Furniture & Fixture	0.00	0.00
7	Library	0.00	0.00
9	Equipments	11.00	10.36
10	Works	21.00	21.00
11	Administrative Expenses		
	Minor Works	54.12	54.12
	Equipment,Vehical Repair	4.45	4.45
12	Miscellaneous Expenses	2.30	2.29
13	Other Sports	4.08	4.08
	TOTAL	**640.65**	**632.24**
	Revenue receipt	**45.78**	

Budget for Plan and Externally funded projects (2012-13) **(Rs.Lakhs)**

S. No.	Head	Plan	
		RE 2012-13	Expd.
1.	Establishment Expd	0.00	0.00
2.	OTA	0.00	0.00
3.	Wages	0.00	0.00
4.	Travelling Allowance	2.00	2.00
5.	HRD	3.00	3.00
6.	Other Charges	213.00	213.00
7.	Livestock	3.64	3.64
8.	Furniture & Fixture	2.10	2.10
9.	Library	10.30	10.30
10.	Equipments	1.50	1.50
11.	Works	11.46	11.46
12.	Administrative Expenses		
13.	Minor Works	0.00	0.00
14.	Equipment, Vehicle Repair	0.00	0.00
15.	Miscellaneous Expenses	0.00	0.00
16.	Other Sports	0.00	0.00
	TOTAL	**247.00**	**247.00**
17.	AICRP	6.70	6.68
18.	VIC	3.45	2.94
19.	IPR	4.60	3.73
20.	NAIP	16.55	8.10
21.	P-Loan and Advance	2.00	1.80
22.	Pension	3.00	1.55


Organization Setup
DIRECTOR
Research Advisory Committee
Management Committee
Research Labs
Farm Section
Core Facilities
Camel Physiology
Camel Genetics & Breeding
Camel Biochemistry
Camel Management
Camel Reproduction
Camel Health Research
Camel Nutrition
Livestock Farming Unit
Camel Dispensary
Agriculture Farm Rangeland
Administration Section
Audit & Account Section
Estate Unit
PME Cell
Guest House
Feed & Fodder Stores
Liaison Officer for Roster
Vehicle Unit
Library
AKMU
Security

3. Research Achievements

Camel Genetics and Breeding

The camel herd strength at the centre on 1st of April 2012 was 383, during the year 17 calves were born. Three Bikaneri and four Jaisalmeri camels were purchased from the tract for breeding purpose. During the year 45 camels were auctioned and 22 camels died due to different ailments. This year 12 camels were distributed in villages through Government of Rajasthan for breeding purpose. The closing balance of camels on 31st March 2013 was 328 (Table 1).

Table 1: Camel Herd Strength (2012-13)

Breed/Age	Opening 1-04-12		Calving		Purchased		Died		Auction		Raj. Govt.		Closing 31.03.13	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Bikaneri														
0-1 Yr	7	5	1	1			2	1					1	1
1-2 Yr	11	8					-	1	1				5	4
2-3 Yr	8	5							2	-			10	7
3-4 Yr	8	7							1	-	5		6	5
>4Yr	19	50			3	-	2	4	5	7	2	-	15	46
Total	53	75	1	1	3	-	4	6	9	7	7	-	37	63
Jaisalmeri														
0-1 Yr	6	10											-	-
1-2 Yr	3	4					1	-					6	10
2-3 Yr	7	3							4	-			2	4
3-4 Yr	5	2							1	1	3	-	3	3
>4Yr	11	32			4	-	1	1	4	5	2	-	9	27
Total	32	51			4	-	2	1	9	6	5	-	20	44
Kachchhi														
0-1 Yr	6	2	5	4									5	3
1-2 Yr	6	6							1	-			6	3
2-3 Yr	3	3							1	2			5	6
3-4 Yr	6	2							2	1			2	1
>4Yr	15	44					1	5	3	3			15	37
Total	36	57	5	4			1	5	7	6			33	50
Mewari														
0-1 Yr	4	3	4	2			1	1					3	1
1-2 Yr	6	9											4	3
2-3 Yr	1	3											6	9
3-4 Yr	3	3											1	3
>4Yr	6	38					1	-	-	1			8	40
Total	20	56	4	2			2	1	-	1			22	56
A*B														
>4Yr	-	3											-	3
Total	-	3											-	3
Grand Total	**141**	**242**	**10**	**7**	**7**	**-**	**9**	**13**	**25**	**20**	**12**	**-**	**112**	**216**

Total Herd Strength – 328

Growth Performance: Data for growth performance analyzed for the body weight at birth, 3 months, 6 months, 9 months, 12 months, 2 years, 3 years and 4 years of age and their respective leastsquares means were 36.61±0.79, 92.14±3.66, 163.67±3.25, 207.53±4.31, 246.41±6.11, 342.15±4.12, 401.63±10.23 and 489.67±11.79 kg. The effect of the year was found highly significant in all the age groups studied whereas the males had significantly ($p<0.01$) higher body weights than females at six months and the difference was highly significant ($p<0.01$) at 3 years and 4 years of age group. The effect of breed was not found significant.

Reproductive performance: The conception rate in the herd was 76.19% and out of 126 females 96 were conceived.In the previous year, 73 females were given service and out of which 46 were conceived (63%) but calving percentage remained 32.6 per cent (Table 2).

Mortality: During 2012-13 the pooled mortality of the herd was 5.88% at the centre and breed wise, age group wise and sex wise mortality is presented in Table 3.

Breeding Plan: Out of 35 male camels, 13 camels in different breeds were selected for farm breeding (Table 4). The criterion of selection was body length for preparation of breeding plan. Independent culling levels were fixed for heart girth and height at wither. During the month of September biometry of all 35 camels was recorded for body length, heart girth and height at wither. The breeding plan was prepared by avoiding inbreeding with care that farm born stud should not be used on a female related to it either through sire or dam. Bikaneri camels (n- 3) were selected for providing free service to the she camels of villagers (Table 5). During this season 90 she camels of the nearby villages were given natural

Table 2: Reproductive performance of the herd (2012-13)

Year	Trait	Bikaneri	Jaisalmeri	Kachchhi	Mewari	Pooled
2010-11	Mating	17	20	18	17	72
	Conception	13	18	13	11	55 (76%)
	Calving	9	12	8	7	36 (65.5%)
2011-12	Mating	18	10	22	23	73
	Conception	12	8	16	12	46 (63%)
	Calving	2	-	8	5	15 (32.6%)
2012-2013	Mating	34+3*	26	32	31	126
	Conception	23+3*	20	22	28	96 (76.19%)

*Arab x Bikaner camels

Table 3: Breed, sex and age group wise mortality (2012-13)

Breed	Sex		Age group			Pooled
	M	F	0-1 year	1-4 years	Above 4 years	
Bikaneri	4	6	3	1	6	10(8.78%)
Jaisalmeri	2	1	-	1	2	3(3.67%)
Kachchhi	1	5	-	-	6	6(6.60%)
Mewari	2	1	2	-	1	3(4.02%)
Total	9(2.37%)	13(3.43%)	5(1.31%)	2(0.5%)	15(3.98%)	22(5.88%)

Table 4: Body parameters of selected and unselected male camels for breeding

Breed	Selection	N	BL	HG	HW
Overall	Selected	13	162.35±1.39*	219.71±2.47	212.14±1.98
	Unselected	22	158.18±1.11	216.40±1.97	207.45±1.58
Bikaneri	Selected	4	167.75±1.66**	227.75±3.58	215.50±4.19
	Unselected	8	159.50±1.17	220.62±2.53	211.62±2.96
Jaisalmeri	Selected	3	161.33±2.68	221.66±4.80	214.66±5.09
	Unselected	5	159.40±2.08	216.60±3.72	206.00±3.94
Kachchhi	Selected	4	162.75±2.11	216.50±5.00	211.25±2.94
	Unselected	7	157.42±1.59	213.57±3.78	204.71±2.22
Mewari	Selected	2	152.50±5.59	205.00±1.58	206.00±1.00
	Unselected	2	152.50±3.59	204.00±1.00	204.0 0±1.41

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

Table 5: Breeding plan for the year 2012-2013

Breed	Available Females	Studs for breeding		Sire	Dam
		Number	Name		
Bikaneri	34+3* (AxB)	602	Cholki	366	463
		692	Suraj	Purchased	
		694	Sharmila	Purchased	
		762	Raja	Purchased	
Jaisalmeri	26	242	Mirgadan	154	55
		386	Vikram	Purchased	
		388	Sunder	Purchased	
Kachchhi	32	204	Pathan	Purchased	
		136	Dhori	114	105
		138	Phulki	72	113
		152	Pilki	114	79
Mewari	31	04	Piliya	Purchased	
		06	Basant	Purchased	

1.Bikaneri males no. 764, 766 and 480 were used for breeding the females of village camel breeders.

service. In a survey conducted to assess the number of she camels conceived in the previous year which were bred by the male camels of the farm ,it was found that out of 93 she camels from villages, 46 she camels delivered the calves (2011-12) and the percent calving was about 50%. During the year 2012-13 twelve breeding male camels were distributed in villages through Government of Rajasthan for breeding the field camels.

Databases : The following databases were maintained and regularly updated

1. Inventory of the Centre's camel herd containing the pedigree information on all available animals of Bikaneri, Jaisalmeri, Kachchhi and Mewari camels.

2. Database for growth of the Centre's camel herd containing data of birth weights of calves born and body weights at different age groups.

3. Reproduction database having records of reproductive parameters.

4. Database on biometry of studs having information on heart girth, height at wither, body length which were updated for preparation of breeding plan.

5. Health database was updated on disease prevalence and mortality of the camels.

Milk production:

To allow proper let down of milk 2 teat milking was done and in which one front and one rear teat was milked and the other two were left for the calf to suckle and milk recording commenced from day 15th after calving. The lactating females were fed as per schedule to meet the nutrient requirements.

Seventen females were used in this study and the average daily milk production was 2374±16.7 ml with highest daily milk production recorded was 2599±29.3 ml Jaisalmeri followed by 2413±27.6 ml in Bikaneri, 2283±30.2 ml in Kachchhi and 2200±29.1 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 6). The production was highest in 2nd parity (2474 ml) followed by 5th (2424 ml), 1st (2360 ml) and 4th (2237 ml). The effect of parity was highly significant (P<0.01).

Table 6: Average daily milk production of dromedary breeds in different parity during the year 2012-13

(Two teat milking, milk yield in ml)

Parameter	MF	MR	EF	ER	TOTAL
Pooled	588±4.2 (6239)	709±4.4 (6239)	396±3.2 (6239)	505±3.5 (6239)	2374±16.7 (6239)
Breed	**	**	**	**	**
Bikaneri	590±7.1 (1235)	717±7.3 (1235)	390±5.2 (1235)	494±5.8 (1235)	2413±27.6 (1235)
Jaisalmeri	647±7.5 (1577)	769±7.8 (1577)	423±5.6 (1577)	546±6.2 (1577)	2599±29.3 (1577)
Kachchhi	569±7.7 (1561)	689±8.0 (1561)	390±5.8 (1561)	493±6.4 (1561)	2283±30.2 (1561)
Mewari	545±7.4 (1866)	662±7.7 (1866)	379±5.5 (1866)	485±6.1 (1866)	2200±29.1 (1866)
Parity	**	**	**	**	**
1	579±8.2 (1127)	708±8.5 (1127)	401±6.1 (1127)	520±6.7 (1127)	2360±31.9 (1127)
2	619±4.0 (3671)	745±4.2 (3671)	406±3.0 (3671)	518±3.3 (3671)	2474±15.8 (3671)
4	556±8.4 (1089)	677±8.7 (1089)	359±6.2 (1089)	461±6.9 (1089)	2237±32.9 (1089)
5	597±14.2 (352)	707±14.8 (352)	415±10.6 (352)	520±11.7 (352)	2424±55.7 (352)

MF/EF-Morning/Evening Front teat MR/ER- Morning/Evening Rear teat

For pooled analysis all 82 lactations recorded from 2008 to 2013 were used which encompassed 31 Bikaneri, 4 Jaisalmeri, 26 Kachchhi and 21 Mewari camels in lactation. In the year 2008-9, 2009-10, 2010-11, 2011-12 and 2012-13 respectively 10, 17, 18, 20 and 17 camels were evaluated. The parity-wise distribution was 18, 33,18,12 and 1 record respectively belonged to 1st , 2nd , 3rd , 4th and 5th parity. The analysis

Table 7: Milk production potential of Indian dromedary breeds (2008-13)

Breed	Parity	Year					Pooled
		2008	2009	2010	2011	2012	
Bikaneri	1	2912±115 (3)		2875±139 (3)			2896±88 (6)
	2	2739±110 (3)	2969±128 (3)	2903±141 (2)	1937±120 (2)	2286±165 (2)	2630±64 (12)
	3		3087±171 (3)	2941±219 (1)	2154±149 (3)		2658±110 (7)
	4		1961±130 (1)	3417±261 (1)	2640±97 (2)	2363±401 (1)	2617±110 (5)
	5					2220±379 (1)	2220±379 (1)
	Pooled	2824±80 (6)	2845±101 (7)	2972±87 (7)	2240±80 (7)	2286±163 (4)	2680±44[a] (31)
Jaisalmeri	2					2827±158 (2)	2827±158 (2)
	4					2286±126 (2)	2286±126 (2)
	Pooled					2547±106 (4)	2547±106[a] (4)
Kachchhi	1		2485±151 (1)	2662±125 (2)	1919±119 (2)	2197±51 (1)	2302±72 (6)
	2		3168±106 (5)	3523±246 (1)	-	2371±155 (3)	2951±89 (9)
	3	5085±508 (1)	-	3607±196 (2)	2741±124 (3)	-	3469±156 (6)
	4	3784±228 (3)	3494±273 (1)	2359±244 (1)	-	-	3538±172 (5)
	Pooled	4123±223 (4)	3116±91 (7)	3119±111 (6)	2404±99 (5)	2329±118 (4)	3039±65[b] (26)
Mewari	1			2531±117 (3)	2149±120 (1)	2195±83 (2)	2358±71 (6)
	2		2691±290 (3)	2996±192 (1)	2227±91 (3)	2198±109 (3)	2437±96 (10)
	3			2904±149 (1)	2608±101 (4)		2663±87 (5)
	Pooled		2691±290 (3)	2706±89 (5)	2406±65 (8)	2197±74 (5)	2471±55[a] (21)
Over all	Over all	3291±105[c] (10)	2942±75[b] (17)	2945±56[b] (18)	2349±45[a] (20)	2334±57[a] (17)	2737±31 (82)

of variance and mean separation was carried out to see the effect of breed, parity and year on the milk production performance of the dromedary breeds. The effect of breed, parity and year along with the interaction of breed with year and breed with year and parity (Table 7)was highly significant (P<0.01). However, the effect of breed with parity was non-significant (P>0.05). Pooled over breeds the average per day milk production was 2737±31 ml. There were three subgroups with respect to year and the per day milk production in the year 2008-9 was highest followed by 2009-10 & 2010-11 which was similar and it was followed by 2011-12 and 2012-13 which was also similar. In all 5 parities evaluated the highest milk production was recorded in 3 rd and4th parity followed by 2nd and 1st Parity.

Peak Yield and Lactation Curve

Pooled analysis of data for 2008-9 to 2011-12 indicated that the arrival of peak yield in individuals varied considerably. The effect of breed, parity and year on month of peak yield was non-significant (P>0.05). However, pooled over individuals of parity 1, 2, 3 and 4, it was achieved variably from 4to 7 month of lactation . Pooled over parities the peak yield was 3409 ml which was achieved in 5th month. The lactation curve was derived. The mean separation, correlation and regression study indicated that 1st month's production significantly differs from the second cluster of 2nd to 9th month but not from the production of 10th to 12th month. The production of 13th to 16th month forms another cluster. However, the number of subsets was 8 in all.

Lactation Yield

Lactation yield was computed on the rationale of equal production from the two teats of either side. The average lactation yield, thus calculated, was 1883±75, 2239±88, 2520±100 and 3017±148 litres for the lactation length of 10, 12, 14 and 16 months, respectively (Table 8). The effect of breed on lactation yield was

Table 8: Lactation yield in Indian dromedary breeds at different stages of lactation

(Milk yield in litres, estimated for four teats)

Parameters	Lactation Length			
	10 Months	12 Months	14 Months	16 Months
Overall	1883±75 (63)	2239±88 (59)	2520±100 (48)	3017±148 (28)
Breed	NS	NS	NS	NS
Bikaneri	1816±114 (25)	2152±134 (24)	2357±150 (21)	2795±199 (16)
Kachchhi	2137±129 (22)	2590±155 (20)	2873±175 (17)	3479±255 (9)
Mewari	1597±154 (16)	1887±180 (15)	2295±211 (10)	2627±441 (3)
Parity	*	NS	NS	NS
1	1596±150 (15)	1892±173 (15)	2135±198 (12)	2676±303 (7)
2	1833±126 (22)	2160±146 (22)	2473±164 (19)	2822±243 (10)
3	2150±145 (17)	2545±175 (14)	2845±201 (11)	3639±312 (6)
4	1933±192 (9)	2379±237 (8)	2623±267 (6)	2980±337 (5)
Year	**	*	*	NS
2008	2597±185 (10)	3027±214 (10)	3448±232 (9)	3684±265 (9)
2009	1930±159 (15)	2234±184 (15)	2586±195 (14)	2700±255 (9)
2010	1962±136 (18)	2351±162 (17)	2629±172 (15)	2907±241 (10)
2011	1375±127 (20)	1709±155 (17)	1862±208 (10)	

Figures in parenthesis indicate number of animals

non-significant (P>0.05). The effect of parity was significant (P<0.05) only when the lactation yield was considered for 10 month duration. However, the effect of year was significant. It was observed that the animals which were conceived traditionally in next breeding season continued producing milk up to 14 to 16 months . It was also observed that the animals which were bred immediately after calving i.e. after 30 days or thereafter, continued the lactation for about 10 months period. The average lactation yield for 10 months' duration has been worked out to be 1883±75 litres and for 16 months has been worked out to be 3017±148 litres .

Persistency of Lactation

The lactation persistency was 76.20, 67.07, 55.67 and 35.87 % when calculated for lactation length of 10, 12,14 and 16 months, respectively (Table 9). The effect of breed and parity was non-significant (P>0.05) but that of year was significant.

Prediction of Lactation Yield

Eleven mathematical models were fitted to observe the accuracy of prediction and it was observed that linear, quadratic and cubic functions gave better fit (R^2e"0.90) as compared to other functions. For the sake of simplicity, without losing much accuracy, the linear equation can be utilized for the purpose. Since the month with peak production was highly variable and was at a quite later stage, an attempt was made to predict the lactation yield as early as possible. It was observed that 5^{th} month gave the best R^2 values and the gain in accuracy was from 0.634 to 0.900. Therefore, the mathematical equation $Y=106.727+ 238.597(Y_{5m})$ can be utilized for prediction of 10 months' lactation yield. For the prediction of lactation yields of lactation lengths of 12, 14 and 16 months, the constants and regression coefficients as defined in Table 10 may be utilized with acceptable accuracy (R^2-0.90) and suitable decision to retain an animal in production can be taken accordingly.

Table 9: Persistency of lactation in Indian dromedary at different lactation lengths

Parameter	Persistency (%)			
	10 Months	12 Months	14 Months	16 Months
Overall	76.20± 2.25 (63)	67.07±1.93 (59)	55.67±2.70 (48)	35.87±3.29 (28)
Breeds	NS	NS	NS	NS
1	76.86±3.42 (25)	68.16±2.92 (24)	58.24±4.04 (21)	37.62±4.42 (16)
3	74.00±3.88 (22)	64.91±3.39 (20)	49.22±4.70 (17)	34.70±5.67 (9)
5	78.51±4.63 (16)	68.29±3.94 (15)	60.48±5.68 (10)	31.52±9.82 (3)
Parity	NS	NS	NS	NS
1	78.10±4.49 (15)	70.72±3.79 (15)	60.86±5.32 (12)	35.18±6.75 (7)
2	81.44±3.78 (22)	71.38±3.19 (22)	49.31±4.43 (19)	41.72±5.40 (6)
3	74.69±4.35 (17)	61.13±3.83 (14)	58.80±5.40 (11)	31.55±6.95 (6)
4	68.17±5.76 (9)	63.68±5.19 (8)	54.87±7.19 (6)	33.58±7.50 (5)
Year	NS	**	*	NS
2008	69.51±5.55 (10)	65.60±4.69 (10)ab	53.72±6.24 (9)	35.85±5.90 (9)
2009	75.20±4.78 (15)	62.22±4.03 (15)a	47.94±5.25 (14)	38.52±5.67 (9)
2010	75.41±4.08 (18)	62.57±3.55 (17)a	48.47±4.64 (15)	33.61±5.38 (10)
2011	81.53±3.80 (20)	77.66±3.38 (17)b	72.41±5.60 (10)	-

Figures in parenthesis indicate number of animals

Table 10 : Prediction of lactation yield using average daily yield of different months and linear mathematical function

Month	Lactation Length											
	10 Months			12 Months			14 Months			16 Months		
	R^2	Constant	b_1	R^2	Constant	b_1	R^2	Constant	b_1	R^2	Constant	b_1
1st	0.63	314.300	238.806	0.64	426.744	261.410	0.67	492.445	293.343	0.57	567.303	302.831
2nd	0.78	302.043	208.621	0.75	424.964	223.789	0.75	569.188	230.076	0.67	506.139	268.378
3rd	0.83	249.316	202.760	0.80	358.621	220.087	0.81	429.395	238.609	0.75	494.234	249.219
4th	0.89	134.788	233.807	0.89	224.376	257.243	0.89	324.703	269.927	0.86	373.957	284.632
5th	0.90	106.727	238.597	0.90	173.848	267.195	0.90	281.961	279.456	0.91	317.148	298.527
Peak	0.898	48.392	232.063	0.89	140.741	252.212	0.90	257.474	261.622	0.88	233.928	289.316

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

The primers for amplification were designed and six 5' flanking regions of milk protein genes, viz. α- Casein, Lactoperoxidase, Whey Acidic Protein, Lactoferrin, Peptidoglycan RP, α- S1-Casein and α-casein were successfully amplified in the dromedary. The amplified fragments were characterized by RFLP using suitable restriction enzyme. (Table 11, Fig.1 &2). The amplicons were eluted using gel extraction kit and products were cloned in pGEM-T easy cloning vector. Full length sequencing was carried out. Further analysis of the

Table 11: Characterisation of 5' flanking regions of dromedary by RFLP

Promoters	Product	RE	Fragments (bp)
k- Casein	1184 bp	EcoRI	441, 743
Lactoperoxidase	1205 bp	Msp I	330, 875
Whey Acidic Protein	1310 bp	EcoRI	349, 961
Lactoferrin	1085 bp	PstI	115, 964
Peptidoglycan RP (Exon-1)	476 bp	PvuII	103, 373
á- S1-Casein	623bp	Msp I	152, 471
â-casein	571 bp	PvuII	140, 431

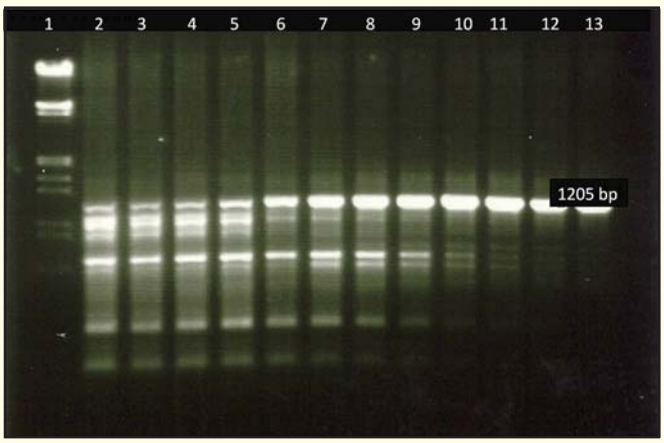


Fig. 1. Gradient PCR amplification of Lactoperoxidase5' flanking regions in dromedary (Lane 2-13), Lane 1: λDNA/EcoRI+HindIIIMarker.

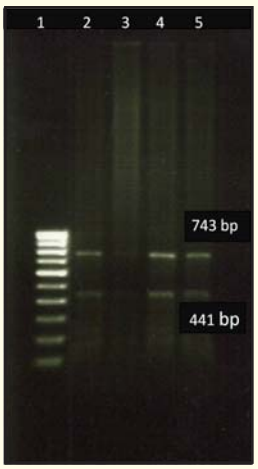


Fig. 2. RFLP of k-Casein 5'flanking region in dromedary (Lane 2,4,5), Lane 1:100bp ladder

sequence was carried out for k-casein. The dendrogram was constructed (Table 12). The results suggested that the k-casein 5' flanking region and partial gene conserved across dromedary and Bactrian camels. The sequence homology was about 80% with equines and about 85% with buffalo, sheep and goat.

Table 12: Kappa Casein Promoter Sequence

T A G A A A A T C T C A A C T T A C T C T G T
G C A A A C T G A A T A A A C A T T T T A G
G G T T C T A A A C A T C A C T C C T A
A C T T T C T A A G A C A T G A A A T A C T T
C T A A G A A A A A A G A G G A C T A C A
A C A C A A T G C T G T T A T T A T T T C T T G T T T G T G T
T C T G G C A G T C C T C A T T G A T T C C T G T A A A T A C
C T C A A T C T G G C C A A G G A C T
T C A T A G C T A A G G T G A A G T C 2 A C
A G T T A A C A T T T T T T T C T C C A G A G A A A T G T A T G C A
A A A G A A A A T A T T C T T C T C T G A A
T C A T C T A A G C A A A T T A T T
T G G T T A G C T A T A T T T T A C C A A A A T A T C T
C C C A T A T T G G T A G T T T T A T G A T A T
A T A C T T T G T A A G T T A G A A T G
A G C T G T C T T T G A A A C A A A A C
A A T T A T T C T G A A T T C A A T A A T T T A A T T T T
G T A T T T C C C G A A T G T T T C A C C T G T
A T T A T T G A A A T T T A A A A A T C T A A A T
G C A A C A T T G A T T C A T A A A A G G T T A
A T C A A T C A T C A A G T A T A C A T T G A A
T G T T T A T A C C A T G A A C T T A C T G A A
G A A T A A A A T G C A A A T G G C T T T G C
T A C T T T A T A T T G A T T A A A A T A T T T C A
T A T T T A G A T T T A A C T T G T A T G A A G T T G C T C T T
G G G T A T A T T T A A G A A A T G G T C T G T T T T
C T A A T T T C T G A A A A T C A A T G A T T G T A
A G T C T G G A A G G A A G A T G A C C A A
C C A C A G C C C A T A A T A T A T A T A G A G G G T C A C T T
G A T A T C C A G G T T C T T A A A C T A A A A A
G A A A C A T T T G A A T A T A A A A A G T G T T G
T G A C C A G C T A T T A T C A T T T T A A C A A
T A C C T T C C A A T T C A A A T A G G T G G A A C T C G T T G A T T G
A G A A T G C A A T T A A T T T T T T T A A A A C T C
C T A T A T A T T T T T T C A T A A A A C A T A A
A A A T G C A T T C T T T A A A A A G G T G G A T A G T C T C T T T T C A
A G C T T T A T A A A T G A C A A C T G T G T T T C C
T C C T A T G C A C T T C A C T A A C C A C A G G T
G A C A C A A A G A T G A C T C T G C T A T C G T C A
A A T C T T T C C T T T T T T G T C A T C T T C C T A T
T G G G T G G A A A G T A G G A G G G A G A T A A A T C A C
A T G A G C C A A A G C A C T A A C A C C C A T T A A T
T A G T C T C C A G C T A T T T A C C T

Camel Physiology

During the year camels in different physiological stages like Pregnancy, Non pregnant, Pubertal and pre pubertal stages were evaluated for body scores on the five point scale. The physiological responses were recorded as per their Body condition score (BCS). BCS in most of pregnant and lactating animals was either 3 or 3.5 attributed to better management conditions. Haematological and biochemical parameters did not reflect any significant change (Table 13).

Results shown in the given table 14, indicated that blood Malondialdehyde levels were significantly($p<0.05$) higher in lactating camels than the control, while reduced glutathione and catalase levels were significantly($p<0.05$) lower in lactating she camels. In the pregnant camels reduced glutathione and catalase levels were significantly ($p<0.05$) lower than the control camels however there was no significant difference found in the blood malondialdehyde levels than the control camels in pregnant camels. Plasma vitamin E levels were found similar in lactating and pregnant camels than the control.

To know the relationship between body condition score (BCS), placenta weight and calf weight, a study was conducted on 18 females with 3.0 BCS and 29 females of 3.5 BCS. This study showed that camel with BCS 3.0 has lower placenta weight and calf weight than animals with BCS 3.5 but the difference was non significant.

Camel draught evaluation:

In order to know the effect of ploughing on haematological and blood biochemical parameters in both adult male (n=5) and female (n=6) work camels the study was conducted in three villages viz. Ranasar, Doradas and Bisanpura of District, Jhunjhunu. All studied haematological parameters were in normal range in both male and female camels before work. After the camels were put up to work of ploughing for 12 hours with one hour rest interval, the haematological parameters *viz.,* packed cell volume ($P<0.05$) and RBC ($P<0.001$) content decreased significantly in both male and female camels. Haemoglobin value also decreased in both but in male it decreased at ($P<0.05$) and in females at

Table 13: Relationship of BCS of pregnant and lactating camels with physiological, haematological, biochemical, and hormonal indices

PARAMETERS	Pregnant			Lactating		
	BCS3.0	BCS 3.5	Overall	BCS3.0	BCS 3.5	Overall
Physiological response						
Temperature (°C)	37.7±0.11	37.5±0.15	37.6±0.10	37.7±0.08	37.7±0.07	37.7±0.05
Pulse rate (pulse/min)	60.8±0.67	59.9±0.88	60.3±0.55	58.8±0.50	59.0±0.40	58.9±0.32
Respiration rate (breath/min)	16.1±0.35	15.6±0.46	15.8±0.29	15.3±0.26	16.6±0.21	16.0±0.17
Blood biochemical parameters						
Total protein (g/dl)	8.1±0.32	7.4±0.46	7.8±0.28	7.5±0.24	7.7±0.20	7.6±0.15
Cholesterol (mg/dl)	34.9±3.18	38.9±4.5	36.9±2.76	44.9±2.35	47.8±1.92	46.4±1.52
Albumin (g/dl)	4.0±0.21	4.1±0.30	4.1±0.18	4.5±0.17	4.4±0.16	4.4±0.12
Glucose (mg/dl)	94.6±4.24	99.2±6.0	96.9±3.67	79.7±3.8	78.9±2.73	79.3±2.34
Creatinine (mg/dl)	1.6±0.05	1.4±0.08	1.5±0.05	1.4±0.05	1.4±0.03	1.4±0.03
Haemoglobin (g/dl)	11.8±0.13	12.3±0.18	12.0±0.11	12.6±0.09	13.0±0.08	12.8±0.83
PCV(%)	36.4±1.74	38.7±2.47	37.5±1.51	40.3±1.29	43.5±1.05	41.9±0.83
Stress Endocrines						
T3 (ng/ml)	1.6±0.22	1.5±0.31	1.6±0.19	2.0±0.16	2.2±0.13	2.1±0.10
T4 (ng/ml)	133.3±14.13	173.3±20.0	153.3±12.24	157.9±10.4	140.0±8.52	148.9±6.7
Cortisol (nmol/l)	136.3±21.22	120.0±30.0	128.1±18.38	189.1±15.67	224.7±12.80	206.9±10.12
Blood Cell counts						
TEC (10^6/µl)	8.0±0.07	8.1±0.09	8.1±0.06	8.3±0.05	8.4±0.04	8.3±0.03
TLC (10^3/µl)	136.3±8.94	120.0±12.65	128.1±7.74	11.8±6.60	12.1±5.39	12.0±4.26
DLC (%)						
Neutrophils	34.0±0.83	33.3±1.18	33.7±0.72	32.5±0.61	32.2±0.50	32.3±0.40
Lymphocytes	59.6±1.88	63.3±2.66	61.5±1.63	59.6±1.39	57.7±1.14	58.6±0.90
Monocytes	2.4±0.26	2.7±0.37	2.5±0.23	2.4±0.19	2.5±0.16	2.5±0.12
Eosinophil	3.5±0.3	4.2±0.42	3.8±0.26[a]	3.1±0.22	3.1±0.18	3.1±0.14[b]
Basophil	0.7±0.15	1.0±0.21	0.8±0.13	0.5±0.11	0.3±0.09	0.4±0.07

Table 14 : Biomarkers of oxidative stress per ml of whole blood

	Pregnant (N6)	Lactating(N5)	Non pregnant-non lactating(N10)
Malondialdehyde (nanomol/ml)	28.11±0.44*	26.08±1.40	25.86 ±0.91
Catalase (IU/ml)	3569 ±322*	3251 ±569*	5759±174
Reduced glutathione (mg/dl)	9.66 ±1.13*	10.44 ±1.58*	16.06±0.82
Plasma Vitamin E (mg/L)	2.31 ±0.42	2.75±0.29	3.00±0.13

*significant ($p<0.05$)

Table 15: Haematological and biochemical blood attributes on male and female camels before and after work

Parameters	Male		Females	
	Before Work	After Work	Before Work	After Work
Haematological				
Hb* (g/dl)	11.68±0.22	10.76±0.08	10.91±0.31	10.23±0.35
RBC** (x10^6/ì1)	10.6±0.11	9.98±0.08	9.60.31	8.65±0.32
PCV* (%)	33.2±0.66	31.64±0.48	32.5±0.81	30.5±0.62
Biochemical				
Glucose (mg/dl)	85.4±2.78	80.2±0.91	84.33±0.76	81.66±0.42
Total Protein (g/dl)	7.57±0.45	7.14±0.22	7.710.28	7.43±0.27
Albumin (g/dl)	4.74±0.28	4.94±0.43	4.22±0.15	4.72±0.22
Cholesterol (mg/dl)	33.78±1.89	32.13±3.13	40.112.69	37.89±2.08
Glucose (mg/dl)	85.4±2.78	80.2±0.91	29.87±5.28	28.48±2.66

*(P<0.05) and **(P<0.001)

(P<0.001) level. All biochemical parameters studied except albumin were also marginally decreased after the ploughing work in male and female animals. The level of albumin was slightly increased in both groups of animals after completion of draught work. The difference in biochemical parameters was not significant (Table 15).

Camel Reproduction

Phero-Chemical analysis in the urine of dromedary camel (*Camelus dromedarius*)

In order to detect the possible pheromones in urine of nonpregmant females during nonbreeding and breeding season and compare it with pregnant camels, the study was undertaken in which by ultrasonography- all the experimental females were identified as (i) pregnant, (ii) non-pregnant with follicles during the non-breeding season and their urine was collected in natural condition with least disturbance to animal. Similarly during the breeding season the females were again identified with follicles by ultrasonography and urine samples were collected on the day of mating (natural selection of female by male for mating) (table16) and the samples have been sent to IPFT, Gurgaon for further analysis.

Table 16: Follicular size in mated female camels

Animal No.	Mating on day after commencement of study	Follicle size on day of mating (mm)	
		Left ovary	Right ovary
B 541	0	18, 20	
	4	10	
	10		17
B 631	3	23	16
	8		Many follicles coalesced
	24	17	17
B 611	12	24	15
B 477	14	8	11
B 561	15	8	5
B 481	18	48	53,33
B 621	21		20
B 575	22	43	15, 11
B 627	25		17, 9

Camel Biochemistry

Production and evaluation of bioactive compounds from camel milk

In order to assess the bioactive properties of fermented milk the milk samples were collected from 16 she camels in their late lactation stage i.e. from healthy four camels of each breed viz. Bikaneri, Jaisalmeri, Kachchhi and Mewari. Further, milk samples from four of each lactating Rathi cows and buffaloes were also collected.

All the samples were analyzed for their chemical composition viz. fat, protein, SNF and pH. Each sample was divided in three groups raw, pasteurized and boiled. These were fermented using *Lactobacilli Acidophilus* starter culture to produce bioactive peptides. Samples were processed by centrifugation and the transparent supernatants were kept at -20 ^{0}C for further analysis to evaluate bioactive properties.

Antioxidative Property in camel milk

The antioxidant concentration (mM relative to the concentration of Trolox standard) in the supernatants of raw milk samples of all the four Bikaneri, Jaisalmeri, Kachchhi and Mewari breeds was measured using antioxidant assay kit. The antioxidant level before and after fermentation ranged from 0.04±0.008 to 0.05±0.01 and 0.53±0.03 to 0.59±0.04 respectively (Table 17). The antioxidant activity recorded was significantly ($p<0.001$) higher in the fermented in comparison to raw milk samples (before fermentation) in all the four breeds of camels while no significant difference was recorded among the camel breeds.

Table 17: Determination of antioxidant activity in raw milk samples before and after fermentation in different breed of Indian camels*

Camel Breeds	Antioxidant Activity (mM)	
	Before fermentation	After fermentation
Bikaneri	0.04±0.008	0.54 ± 0.03
Jaisalmeri	0.04 ±0.003	0.53 ±0.09
Mewari	0.05± 0.022	0.59 ± 0.04
Kachchhi	0.05±0.010	0.53±0.07

* Mean value ± SE of four milk samples

Antimicrobial Property in camel milk:

In an antimicrobial study with fermented milk supernatants, the pooled supernatant of fermented milk samples of Kachchhi breed was used to assess its inhibitory action against *E. coli.* Different concentrations as 1.0, 2.5 and 5.0 per cent of the supernatant were used and results revealed that there is complete inhibition of bacterial growth at 5 per cent while 40.9 percent reduction in bacterial growth was observed at 2.5 percent. However at 1 per cent concentration no significant reduction in bacterial growth was observed (Table 18).

Table 18: Study of inhibitory action camel fermented milk supernatant against *E. coli*

LB agar plates	No. of *E. coli* colony*			
	1 %	2.5 %	5 %	Control
	R1	38	24	Nil
47				
R2	37	14		27
R3	38	27		36
Total	113	65		110

*@ 1:10^5 per plate

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

Camel milk and milk products developed and to popularize and assess their commercial viability *viz.,* kulfi, flavored milk, pasteurized milk, tea and coffee were sold in the Centre's camel milk parlour. Sale from the camel milk and milk products was highest in December 2012 (Fig. 3). Camel milk and milk products were sold for Rs. 3, 74,710/- during the year.

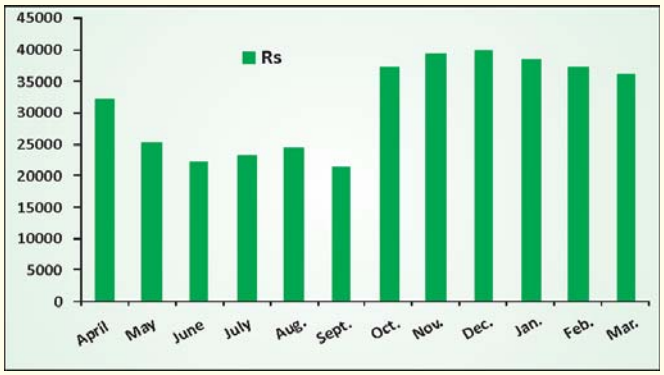


Fig. 3: Sale of milk and milk products during 2012-13

Camel Health

Parasitic diseases

The surveillance of important parasitic diseases of camel and likely vectors were collected during Camel Health Camps organized at various places. The parasitic disease Trypanosomosis caused by *Trypanosoma evansi* put forth a constant threat to the camel husbandry leading to both morbidity and mortality. Besides, GI nematodiasis, Hydatidosis, etc. have also been recorded during the present year.

Trypanosomosis in camel

Trypanosomosis caused by *Trypanosoma evansi* , a major enzootic disease of the dromedary camels and occur in both acute and chronic forms was diagnosed by detection of either antigen or antibodies specific to Trypanosomes and polymerase chain reaction exploiting a set of VSG gene primer was amplified for this detection of active carrier state of infections in camel. PCR found to be superior to Parasitological interpretation in diagnosing the active carrier state of cameline Surra. The periodical occurrence of *T. evansi* infection in camels was compared using blood smear examination and PCR methods.

A total of 518 blood samples were screened and 30.30% were found positive for trypanosomiasis by blood smear examination and 41.89% by PCR detection. The biochemical and enzymatic profile of trypanosomiasis and healthy camels were shown in Table 19.

Table 19: Comparative mean ± SE of some biochemical parameters from naturally *T. evansi* infected camel.

Sl. No.	Parameter	Healthy camel (n=12)	*T. evansi* Infected camel (n-15)
1.	Glucose(mg/dl)	95.05±4.93	26.49±4.39
2.	Alanine amino transferase (U/L)	6.69±0.57	23.67±3.58
3.	Aspartate amino transferase (U/L)	18.29 33.79±2.69	52.39 72.46±2.72
4.	Alkaline Phos-phatase (U/L)	54.20±5.37	151.88±11.14
5.	Gamma glutamyl transferase (U/L)	8.21±0.25	18.28±2.38

There is significant increase in all four enzymes from naturally *T. evansi* infected camels. This observation may be attributed to damage of hepatic cells and the change in blood glucose may be attributed as a common change that may be due to excess utilization of blood sugar by parasites and also depletion of host glycogen.

Gastrointestinal helminth infection in camel

Camel seem to be also prone to helminthic infection due to grazing habit in addition to browsing trees. Gastrointestinal helminthiasis is one of the important parasitic diseases of camels.The different types of infection recorded were mostly *Strongyles,* like *Haemonchus*, *Trichostrongylus*, etc. Besides, *Strongyloides, Trichuris* infection were also noticed with lesser prevalence rate.

A total of 300 faecal samples were screened for parasitic examination and found 47.31% infection rate in 1-3 years age group and 30.52% in >3 years age group.

Hydatidosis in camel

During the period, 2 camels examined through postmortem were found infected with Hydatid cyst. *E. granulosus* hydatid cysts were obtained from both lungs and liver of camel. All the cysts collected were found fertile in nature with the presence of growing protoscoleces. The hydatid cyst in camel irrespective of their organ involvement found multivesicular with several communicating chambers or loculi. The protoscolex of *E. granulosus* is central in the biological cycle of that parasite and is of particular interest in primary and secondary infections.

BACTERIAL AND FUNGAL DISEASES

In total of 31 visits made in villages of Morkhana, Gigasar, Surdhana, Jaimalsar, Norang-desar, Husansar, Shobhasar Deshnokh, Khajuwala, Bamblu and Hamera-rajera of Bikaner once or with more frequency, of the total 306 cases attended 16 cases of bacterial and fungal infections of skin infections and 2 mastitis were treated. The samples were collected from affected camels and isolation and identification of causative agents revealed bacterial infections with *Staphylococcus aureus* (2) from mastitis and From skin infections fungi revealed were *Microsporum nanum* (3), *M. canis* (1), *Trichophyton verrucosum* (2), *T. soudanense* (2), *Candida albicans* (2) and *Aspergillus* spp. (3).

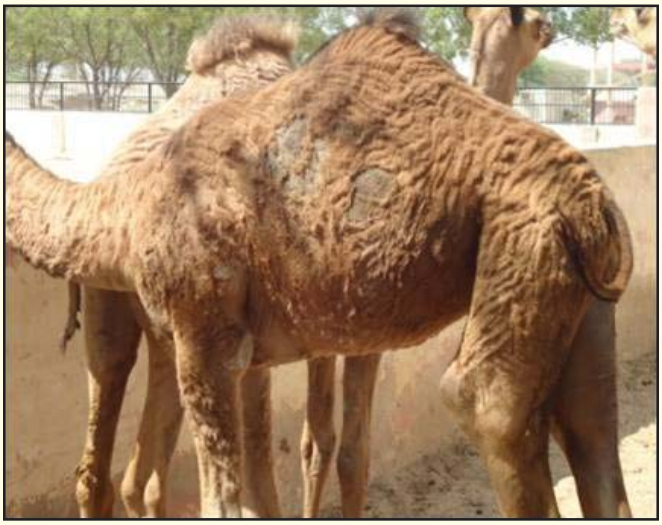
Effective treatment of skin candidiasis (thikria) in camel calves: Fifteen naturally infected camel calves with skin candidiasis**,** were divided into three groups of five calves each, in such a way that each group had the calves with varying degree and severity of the lesions. Aseptically collected skin scrapings of these calves were examined for mycological examination by culturing on Sabourauds dextrose chloramphenicol agar plates. Following treatments regimens were followed in these calves.

Gp.1: 2% potassium iodide in distilled water was applied topically with a duster cloth on alternate days till complete recovery of the lesions.

Gp.2: 6% sulphur (80% sulphur; contact fungicide used in agricultural operations) in mustard oil (*Brassica* spp.) was applied topically with a duster cloth on alternate days till complete recovery of the lesions.

Gp.3: on the 1st day lesions were washed with sodium thiosulphate (10%) solution. Starting the next day 6% sulphur (80% sulphur; contact fungicide used in agricultural operations) and 3% salicylic acid in mustard

Heavily infected camel calf



Calf after debris removal

Table 20: Efficacy of different treatment regimens against skin candidiasis in camel calves

Treatment groups	Duration of treatment	Gross recovery from lesions	Mycological recovery	Recovery of hair growth at the end of the treatment
Gp. 1	10 treatments (19 days)	5/5	5/5	2/5
Gp.2	8 treatments (15 days)	5/5	5/5	2/5
Gp.3	7 treatments (14 days)	5/5	5/5	3/5

oil (*Brassica* spp.) was applied topically with a duster cloth on alternate days till complete recovery of the lesions.

Lesions were observed before each application for growth of the fungus in terms of debris formation or visibility of mycelium, healing of the lesions was confirmed in terms of healthy appearance of the skin and growth of the hairs. Finally skin scrapings from these calves were examined mycologically within three days of the discontinuation of the therapy.

All the three treatments were found effective whereas treatment Gp.3 was comparatively more effective based on rate of recovery of hair in 7 applications (Table 20).

Clinico-pathological investigations in diseased camels

The causes of morbidity and mortality in clinical cases for the year 2013 were investigated and were found to be —debility/emaciation, diarrhoea, prolapse of uterus, pyrexia, lameness, dermatitis, thikria, trypanosomiasis, haemonchosis, abortions, dystokia, still birth, premature birth, mastitis, calf diarrhoea and mange.From total 22 mortalities and ailing animals a total of 108 clinical samples collected which includes blood (49), milk (18), faeces (8), Lymph node aspiration (13) and abortion material (from 20 fetuses).

Histopathological studies in trypanosoma infected aborted fetuses revealed thickened alveolar wall, fibrous tissue proliferation and round/oval eosinophilic yeast cells inside alveoli of lungs (Fig. 4). The identification of yeast

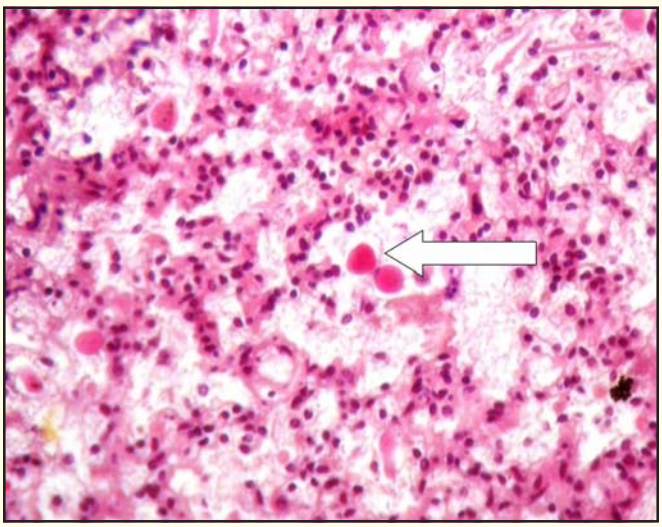


Fig. 4. Lung showing eosinophilic yeast cells (arrow) inside alveoli. H &E X400

cells was attempted by PCR by amplification of CAP59 gene of *Cryptococcus neoformans* fungus but was found negative. The liver showed vacuolar degenerative changes and diffuse necrosis of hepatocytes, brain showed neuronal degeneration, necrosis and congestion and kidney showed tubular degeneration.

Tuberculin skin test performed on 22 camels revealed positive tuberculin reaction in 8 camels but the milk and prescapular lymph node aspiration samples from these 8 camels were processed for culture on LJ media slants revealed no growth. These milk and prescapular lymph node aspiration samples were also subjected to DNA extraction and PCR for amplification of *hupB* gene which revealed seven samples to be negative and only one milk sample may be suspected for tuberculosis and further confirmative tests are under progress (Fig. 5).

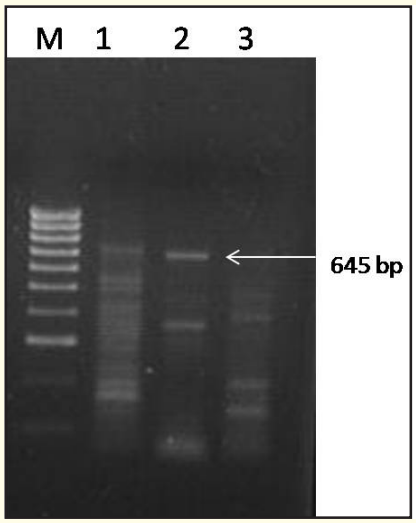


Fig. 5. PCR amplification of hupB gene of M. bovis. Lane M- 100bp marker, lane 1- milk sample B515, lane 2- lung sample from tuberculosis suspected case, lane 3- negative milk

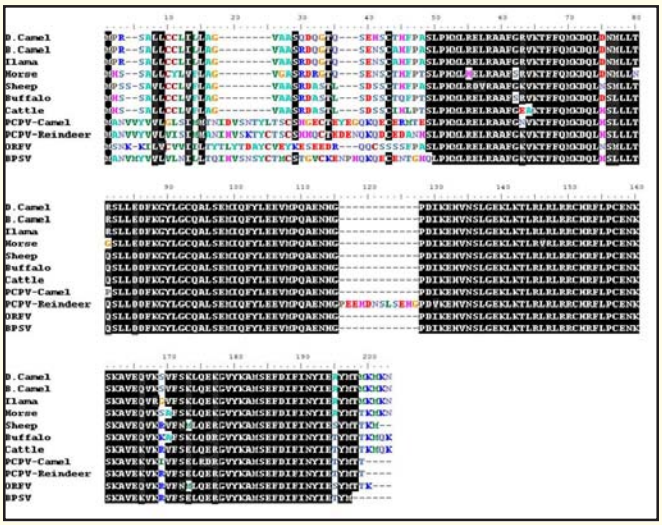


Fig. 6. Alignment of deduced amino acids sequences of the Dromedary camel IL-10 with other livestock species and parapoxviruses using the software BioEdit Version 7.0.9. Shaded areas indicate the conserved regions

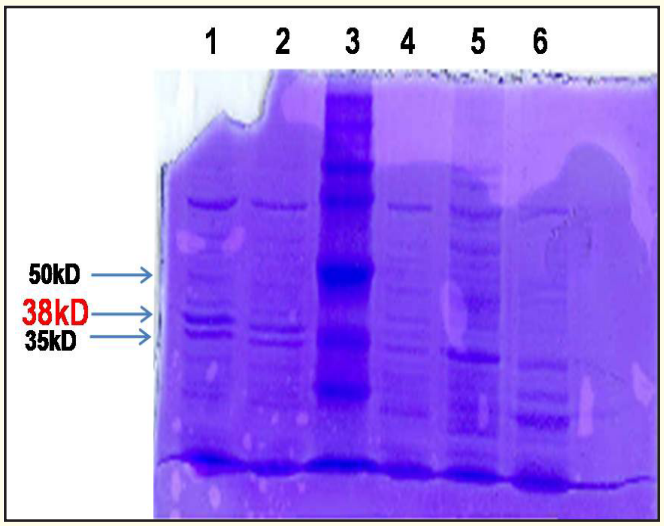
Characterization of Toll like receptors in camel

The TLR-2 gene of dromedary and bactrian camel has been amplified and cloned into pGEM-T vector and sequenced successfully. The TLR-2 gene sequences have been submitted to NCBI. Partial amplification of TLR-5 gene of dromedary camel has been achieved and cloned into pGEM-T vector and sent for sequencing. Simultaneously, the amplification of other TLRs is under progress.

Molecular cloning and characterization of cameline cytokine gene (s)

The complete sequence of the Dromedary camel IL-10 and its comparison to corresponding amino acid sequences from six other mammalian sequences as well as four other PPV are shown in Fig 6 . The open reading frame (ORF) of Dromedary camel IL-10 is 537 bp in length, encoding a length of polypeptide with 178 amino acids. Comparison of the Dromedary camel IL-10 with the corresponding sequences of six farm animal species was carried out. Sequence analysis revealed that the Dromedary camel shared 99.4% and 98.3% sequence identity at the nucleotide and amino acid level, respectively, with the Bactrian camel. On the other hand, Ilama showed 99.0% and 97.1% sequence identity at the nucleotide (nt) and amino acid (aa) level, respectively.The Dromedary camel IL-10 exhibited 62.6% and 68.5% sequence identity at the nucleotide and amino acid level, respectively, with vIL-10 from camel. A phylogenetic tree was constructed based on amino acid sequences of IL-10 gene of common livestock species and parapoxvirus species. It was found that the three camelid species viz., the Dromedary camel, the Bactrian camel and Ilama are forming cluster.

Interferon-Gamma gene of the Dromedary camel was cloned at EcoRI and NotI sites of bacterial expression vector-pET 32 (a) and the recombinant plasmid obtained was named as pETCAMELGAM. It was found that interferon-Gamma of the Dromedary camel was expressed as a fusion protein of 38kDa size (Fig.7).



1,2 & 4-clones; 3-Marker; 5- Uninduced; 6-Vector

Fig. 7. Expression of camel IFN-gamma in *E.coli*

Epidemiology of viral diseases of camels

The complete nucleotide sequences of the epidermal growth factor (EGF) encoding gene of CMLV obtained from India and its comparison to EGF encoding genes of other orthopoxviruses was carried out. The size of the EGF encoding gene of CMLV obtained from India was 418 bp. There is an addition of one cytosine residue at position 132 of the EGF encoding gene of the CMLV isolate from India. Due to this mutation, as expected, the resultant protein was a truncated polypeptide.

Nucleotide sequence homologies of EGF gene of CMLV obtained from India and the other orthopoxviruses (complete sequences available) are shown in Table 21. The nucleotide sequences of the EGF encoding gene of CMLV obtained from India showed 98.8% identity with both CMLV-Kazakhstan and CMLV-Iran strains, which was further confirmed by phylogenetic analysis (Fig. 8).

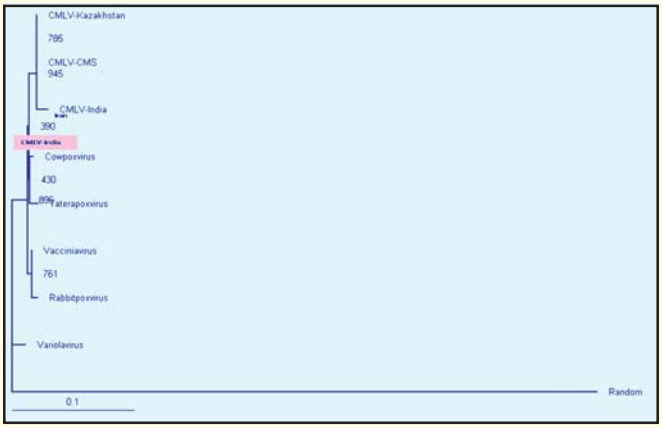


Fig. 8. Phylogenetic tree based on nucleotide sequences of EGF encoding gene of different orthopoxvirus species

Similarly, the complete amino acid sequences of golgi anti apoptotic protein (GAAP) encoding gene (obtained through sequencing) and its relation to GAAP gene of other orthopoxviruses was also carried out. The open reading frame of the GAAP gene of CMLV obtained from India was 714 bp in length, encoding 237 amino acids.

Table 21: Percent identity of nucleotide (nt) of epidermal growth factor gene of CMLV-India with different orthopoxviruses

Sl.No.	Virus isolate	Host	Country and year of isolation	NCBI Accession No.	% nucleotide identity
1.	Camelpox virus-Bikn	Camel	India, 2008	JQ917914	-
2.	Camelpox virus-CMS	Camel	Iran	AY009089	98.8
3	Camelpox virus M-96	Camel	Kazakhstan	AF438165	98.8
4	Taterapoxvirus	Gerbil	Dahomey 1968	DQ437594	97.3
5	Cowpoxvirus	*Callithrix jacchus*	Germany,2002	HQ420898	97.1
6	Vaccinia virus	Not available	Not available	AY313848	96.9
7	Rabbitpoxvirus	Not available	Not available	AY484669	96.4
8	Variola virus	Not available	Not available	DQ441447	94.7

Deduced amino acid sequence homologies of the GAAP encoding gene of CMLV obtained from India and the other orthopoxviruses (complete sequences available) are shown in Table 22. Both the nucleotide and deduced amino acid sequences of this gene showed 99.5% identity with CMLV-Kazakhstan, which was further confirmed by phylogenetic analysis (Fig. 9).

The open reading frame (ORF) of IL-10 from camel parapoxvirus is 561 bp, encoding 187 amino acid polypeptide. The first third of the amino terminal of the proteins exhibits the variation whereas the carboxy terminal portion of the proteins possesses the conserved regions. Comparison of the sequences of vIL-10 from camel with the corresponding sequences of seven farm animal species and three PPVs available in the database was carried out. Sequence analysis revealed that vIL-10 from camel shared 84.7% and 83.4 % sequence identity at the nucleotide and amino acid level, respectively, with vIL-10 from reindeer. With camelids, PCPV- camel showed 62.5-62.8% and 68.0-68.5% sequence identity at the nucleotide and amino acid level, respectively. Among the artiodactyles, cattle shared highest sequence identity with vIL-10 from camel, i.e., 63.1% and 72.2 % sequence identity at the nucleotide and amino acid level, respectively.

Fig 9. Phylogenetic tree based on amino acid sequences of GAAP encoding gene of different orthopoxvirus species

Similarly, the dsRNA binding protein (RBP) encoding gene of parapoxviruses (PPVs) from the Dromedary camels, inhabitating different geographical region of Rajasthan, India were amplified by polymerase chain reaction using the primers of pseudocowpoxvirus (PCPV) from Finnish reindeer and cloned into pGEM-T for sequence analysis. Analysis of RBP encoding gene revealed that PPV DNA from Bikaner shared 98.3 % and 76.6 % sequence identity at the amino acid level, with Pali and Udaipur PPV DNA, respectively. Reference strains of bovine papular stomatitis virus (BPSV) and PCPV (reindeer PCPV and human PCPV) shared 52.8 % and 86.9 % amino acid identity with RBP gene of camel PPVs from Bikaner, respectively. But different strains of orf virus (ORFV) from different

Table 22. Per cent identity of nucleotide (nt) and amino acid ((aa) of golgi anti apoptotic protein gene of CMLV-India with different orthopoxviruses

Sl.No.	Virus isolate	Host	Country and year of isolation	NCBI Accession No.	% Identity	
					nt	aa
1	Camelpox virus-Bikaner	Camel	India, 2008	JF975616	-	-
2	Camelpox virus-CMS	Camel	Iran	AY009089	98.4	98.3
3	Camelpox virus M-96	Camel	Kazakhstan	AF438165	99.5	99.5
4	Cowpoxvirus	Human	Germany, 1998	HQ420897	98.1	96.6
5	Vacciniavirus	Not available	Not available	DQ121394	97.3	94.9
6	Monkeypox virus	Human	Zaire	HQ857562	67	49.1

geographical areas of the world shared 69.5-71.7 % amino acid identity with RBP gene of camel PPVs from Bikaner. These findings indicate that the camel PPVs described are closely related to bovine PPV (PCPV) in comparison to caprine and ovine PPV (ORFV).(Fig.10).

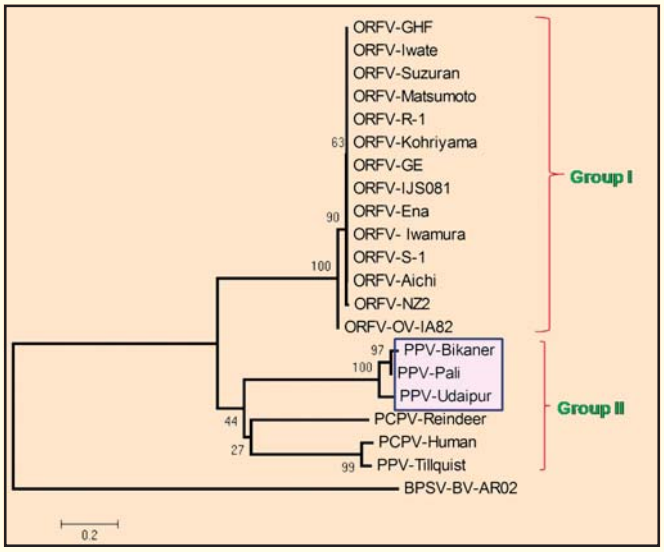


Fig. 10. Phylogenetic tree based on amino acid sequences of dsRNA binding protein encoding gene of different parapoxvirus species

PCR amplification, cloning and sequencing of Heat shock protein 70 encoding gene (HSP A1B) of the Dromedary camel were carried out successfully. The gene sequences of Heat shock protein 70 encoding gene (HSPA1B) of the Dromedary camel amplified from the total cellular RNA isolated from the blood were submitted to GenBank, for which the assigned GenBank accession No. is KC616314. Sequence analysis of Hsp 70 gene revealed that the Indian Dromedary camel shared 99.3 % identity at the amino acid level with humped cattle (*Bos indicus*) and buffalo. Dromedary camel from Russia cattle (*Bos taurus*), sheep and horse shared 99.2 % identity at the amino acid level with the Indian Dromedary camel. A phylogenetic tree was also constructed based on the amino acid sequences of Heat shock protein 70 encoding gene (HSPA1B) of different livestock species and human (Fig.11).

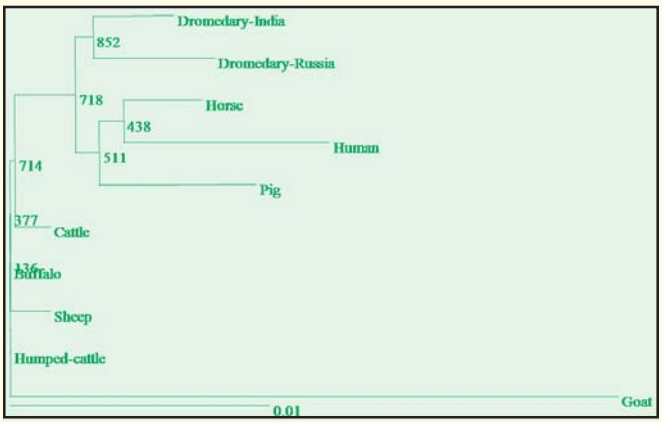


Fig. 11. Phylogenetic tree based on the amino acid sequences of Heat shock protein 70 encoding gene (HSPA1B) of different livestock species and human

Camel Nutrition

Metagenome of digestive tract of camel

In order to study the microbial diversity of gut metagenomes of camel faecal samples were collected from clinically healthy four adult camels and four camel calves of Bikaner district maintained under extensive system of management and stored at -80°C till further DNA extraction. Two faecal samples were pooled and a representative sample was subjected for further genomic analysis. DNA extraction and quantification followed by library preparation as per Ion ChIP-Seq Library Preparation Protocol and template was prepared using Ion OneTouch™ 200 Template Kit. Sequencing run was performed using Ion PGM 300 sequencing kit on Ion PGM sequencer (Life technologies) at Anand Agricultural University, Gujarat. The taxonomic and functional analysis of these metagenomes was performed using different databases as ribosomal RNA databases and protein databases with functional hierarchy information.

The distribution of taxonomical domains based on RDP database is shown in Fig. 12. Based on RNA and Protein data sets the bacterial domain constitutes the major domain ranging 70-100% from different databases. The data was compared to RNA databases and Protein

databases using a maximum e-value of 1e-5, a minimum identity of 80 %, and a minimum alignment length of 50 measured in aa for protein and bp for RNA databases.

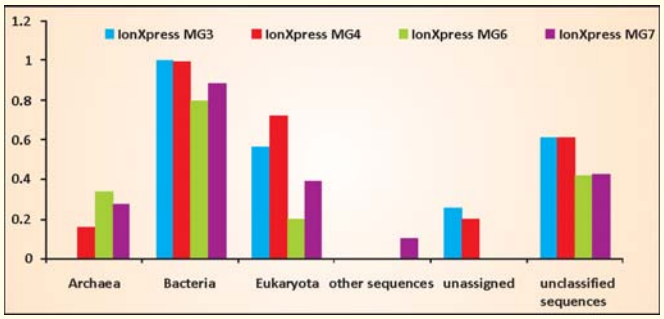


Fig. 12: RDP database

Phylogenetic Classification

Based on RDP database, in the adult camel group (Ionxpress MG 3, IonXpress MG 4) and camel calves group ((Ionxpress MG 6, IonXpress MG 7), the phylogenetic distribution revealed abundant hits were for the Firmicutes followed by bacteroidets, verrucomicrobia and proteobacteria. Based on RDP database the microbial diversity found in the bacterial domain and the comparison of the per cent phylum distribution among different metagenomes is shown in Fig. 13. The genera found in the most abundant phyla of adult camels and camel calves are shown in Figs. 14 &15. The mean per cent of bacterial genera in adult camels showed a majority of Bacteroides, Clostridium, Bacillus, Eubacterium, Ruminococcus *etc*. and in camel calves Clostridium, Ruminococcus, Eubacterium, Treponema, Bacteroides *etc* Figs. 14-15.

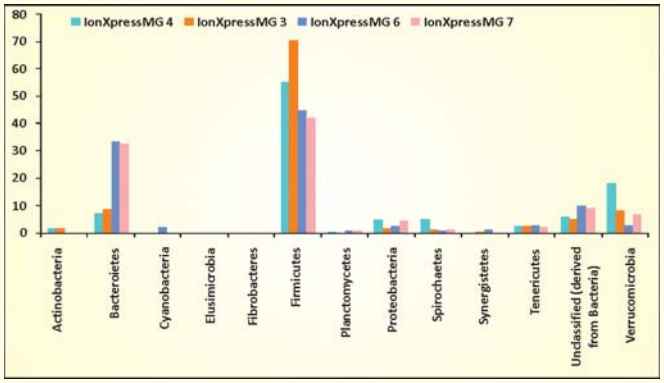


Fig. 13: Percent abundance of phyla in different bacterial metagenomes of calves and adult camels based on RDP Database

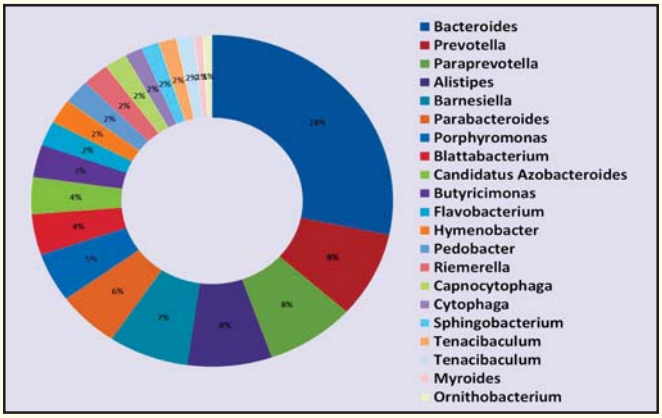


Fig. 14: Different Generas of Bacteroidetes phylum in adult camels

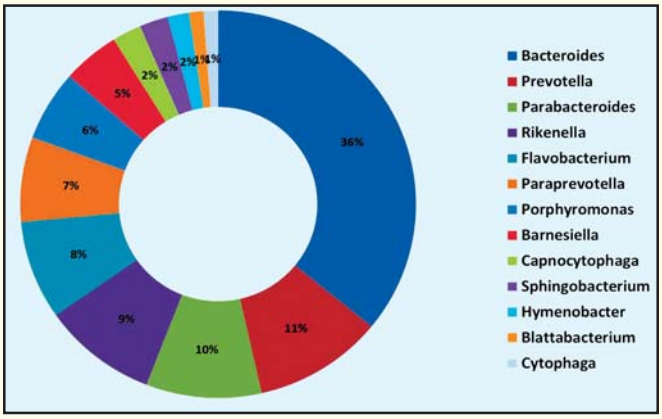


Figure 15: Different Generas of Bacteroidetes phylum in camel calves

Functional Classification

The functional hierarchies in adult camels and camel calves based on subsystems are shown in Figs. 16 and 17, respectively. In adult camels clustering based subsystems followed by carbohydrates, virulence, disease and defence showed more than 10 % abundance and the respiration, sulfur metabolism, aminoacids and derivatives, RNA metabolism, protein metabolism, phages, prophages, transposable elements and plasmids, photosynthesis, membrane transport, stress response,

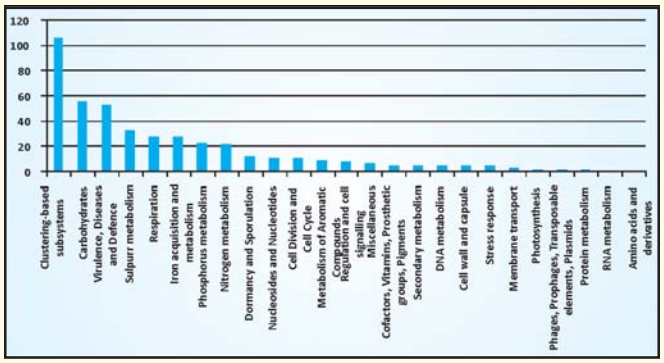


Fig. 16: Functional hierarchy in adult camels based on subsystems

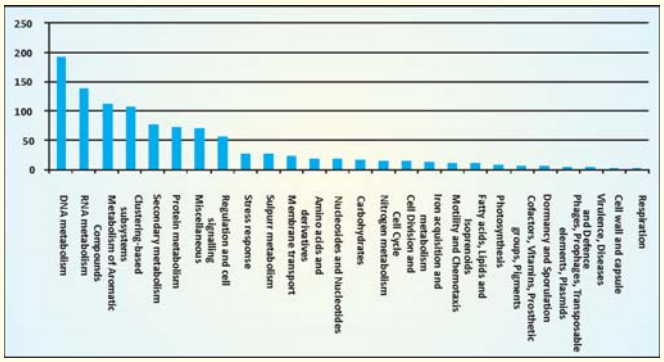


Fig. 17: Functional hierarchy in camel calves based on subsystems

cell wall and capsule, DNA metabolism, secondary metabolism, Cofactors, Vitamins, Prosthetic Groups, Pigments, miscellaneous, regulation and cell signaling, nucleosides and nucleotides, carbohydrates, nitrogen metabolism, cell division and cell cycle, and Metabolism of Aromatic aminoacids showed more than 1-10% functional abundance. In camel calves DNA metabolism, RNA metabolism, Metabolism of Aromatic aminoacids, clustering based systems showed more than 10 % abundance and the secondary metabolism, protein metabolism, miscellaneous, regulation and cell signaling, stress response, sulfur metabolism, membrane transport, aminoacids and derivatives, nucleosides and nucleotides, carbohydrates, nitrogen metabolism,cell division and cell cycle, iron acquisition and metabolism, motility and chemotaxis showed more than 1-10% abundance.

Comparative percent functional hierarchy in adult camels and camel calves based on COG's (Fig. 18) revealed that in camel calves cellular processes and

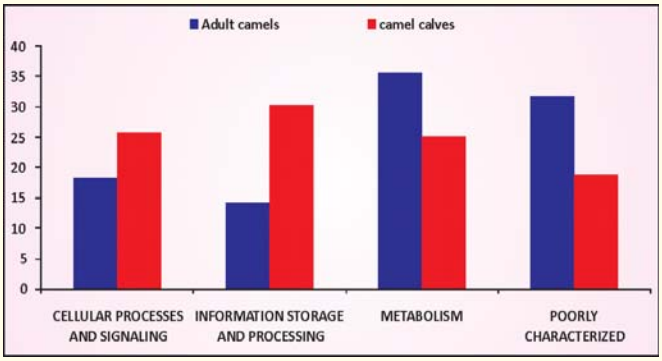


Fig. 18: Comparative percent Functional hierarchy in adult camels and camel calves based on COG's

signalling followed information storage and processing, metabolism functionality are higher where as in adult camels metabolism is the highest functionality. Comparative percent functional hierarchy in adult camels and camel calves based on KO (Fig. 19) revealed highest functionality toward metabolism level functions followed by organismal systems.

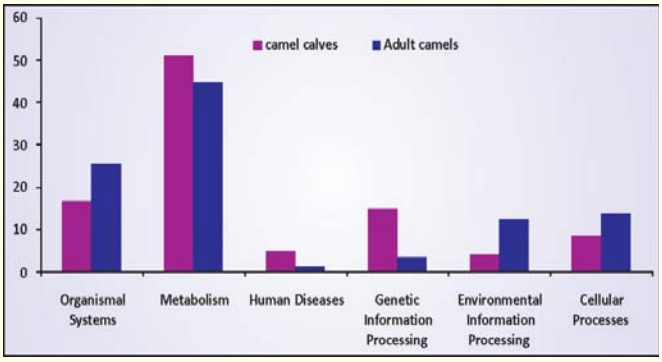


Fig. 19: Comparative percent Functional hierarchy in adult camels and camel calves based on KO

Comparative performance of lactating camels fed 100 and 75% of their requirement

Ten newly calved lactating camels divided equally in two groups were fed up to 42 weeks according to 100

and 75 % of nutrient requirement recommendations and comparative performance were evaluated on roughage and concentrate 50:50 ratio based complete pellets diet having 10% CP and 58.90% TDN. Feeding lactating camels 75% of requirement resulted in significantly (P<0.01) lower DMI (7.26 Vs 10.56Kg/d) and also resulted in lower weight gain (Fig. 20), milk yield but feed efficiency was significantly (P<0.05) better in group fed 100% compared to group fed 75% of requirement (Table 23). Milk composition presented in both groups

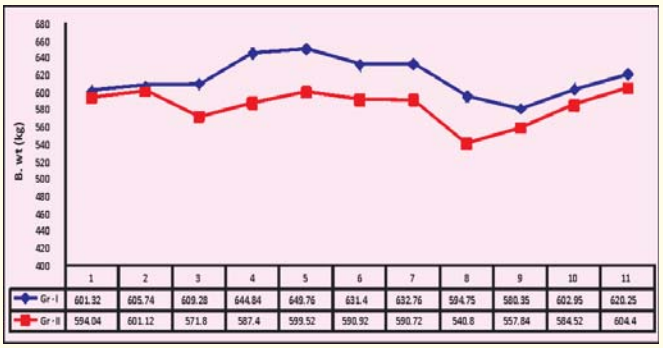


Fig. 20: Monthly body weight changes during lactation

Table 23: Overall Performance of dam (42 wks)

Parameters	Gr.-100%	Gr.-75%
Initial b. wt	601.32±23.06	594.04±27.23
Final b. wt	620.25±24.68	604.40±31.42
Total gain (kg)	18.93	10.38
Avg. Milk Yield (kg/d)	5.01±0.30	4.02±0.22
Avg. DMI (kg/d)**	10.56±0.48	7.26±0.50
Feed efficiency* (Kg DMI /kg MY)	2.22±0.23	1.94±0.26

*P<0.005; **P<0.0001

Table 24: Percent milk composition during experimental period

Groups	Milk composition					
	Fat	Protein	Lactose	Total Solids	Ash	SNF
Early stage < 90 d						
Gr.I	3.15±0.10	2.60±0.004	4.32±0.002	18.75±0.010	0.89±0.000	7.73±0.004
Gr.II	2.98±0.007	2.48±0.002	4.08±0.005	17.57±0.22	0.82±0.001	7.53±0.006
Mid stage (110-200 d)						
Gr.I	2.95±0.007	2.31±0.003	3.94±0.003	16.35±0.14	0.80±001	6.96±0.008
Gr.II	2.81±0.11	2.26±0.003	3.98±0.006	17.97±0.005	0.82±0.001	6.96±0.009
Late stage (<200 d)						
Gr.I	2.90±0.004	2.19±0.001	3.73±0.004	16.35±0.14	0.77±000	6.63±0.06
Gr.II	2.75±0.11	2.15±0.009	3.67±0.001	17.97±0.005	0.75±0.002	6.51±0.004

Table 25: Percent digestibility of nutrients during different stages of lactation

Groups	Percent digestibility				
	DM	CP	EE	CF	NFE
Early stage < 90 d					
Gr.I	60.62±2.87	59.10±4.67	82.83±3.81	29.57±3.81	79.62±3.24
Gr.II	**53.90±3.81**	48.94±5.24	**74.19±7.40**	**24.49±4.87**	**75.32±5.72**
Mid stage (110-200 d)					
Gr.I	59.15±1.91	80.32±1.72	77.33±1.20	25.63±5.53	64.14±0.91
Gr.II	**51.09±0.27**	**81.55±1.07**	**81.55±1.0**	**33.67±3.42**	**55.38±1.40**
Late stage (<200 d)					
Gr.I	60.64±3.26	81.32±1.09	77.74±0.96	21.24±3.53	71.26±1.40
Gr.II	**54.71±2.02**	**81.10±1.82**	**79.85±1.40**	**18.56±5.27**	**59.15± *3.12***

was similar except total solid in early lactation and fat and protein in late stage of lactation (Table 24).No significant effect was observed in digestibility of nutrients in both the groups (Table 25). The growth of calves born to these two group females who were maintained on dam's milk and feed pellets was similar (Fig. 21).

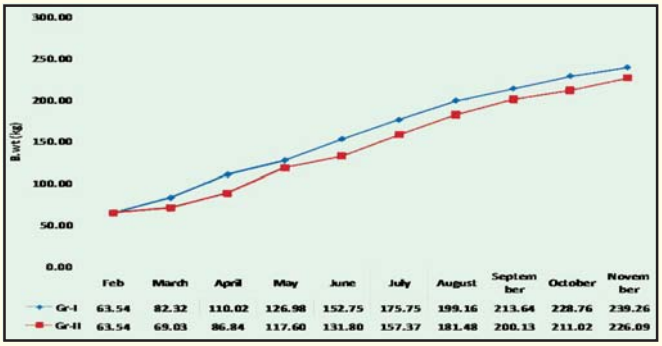


Fig. 21: Monthly changes in body weight of calves

Assessment of nutritional status of lactating camels for improving production performance

To assess the nutritional status of lactating camels, Milk urea nitrogen (MUN) was estimated and it was found to be significantly ($P<0.05$) higher in group fed on diets meeting 100% nutrient requirement than those fed on diets meeting75 % of requirement. MUN level significantly differed with stage of lactation and it was higher in early lactation stages and it was lower in mid lactation. For estimation of purine derivatives uric acid and creatinine spot urine samples were collected and results are presented in Table 26.The said values will be utilized to correlate with the % balance of N values for the lactating camels which will help in indirect estimation of N balance values.

Veterinary Type Culture- Rumen Microbes

Isolation of anaerobic bacteria from feacal samples of Double-humped camels

From adult Bactrian camels maintained at the Animal Husbandry farm of Ladakh region of J and K State, in order to isolate cellulose specific anaerobic bacteria, faecal samples were collected and anaerobic bacteria were isolated using cellulose specific media. On staining with gram's stain and by morphological examination of all 30 isolates (D1 to D-30) first 20 anaerobic bacteria isolates (D-1 to D-20) were found gram positive and were spherical in shape. Two isolates (D21&D22) were gram positive and oval in shape and 8 isolates (D23 to D30) were gram negative and short rods in appearance.

Sugar utilization tests were performed on all the 30 bacteria isolates. All the isolates were able to utilize various sugars viz., glycerol, arabinose, xylose, glucose galactose, mannose, mannitol, lactose, maltose, sucrose, cellobiose, raffinose, trehalose, xylan, starch and salicin. All the isolates showed positive test for catalase, gas production and showed negative motility, except 4

Table 26: Concentration of creatinine, uric acid in urine and milk urea nitrogen during experimental period

Parameters		Early < 90 days	Mid >110-200 days	Late > 200 days
		Milk samples (n=350)		
MUN (mg %)	Gr-I	30.87±2. 37^{c}	13.56±0.47^{a}	20.67±0.90^{b}
	Gr-II	22.72±2.22^{b}	14.27±0.57^{a}	21.90±1.29^{b}
		Urine samples (n=72)		
Creatinine (mg/lit)	Gr-I	832.20±91.05	557.27±59.20	1176.24±122.02
	Gr-II	516.89±92.61	445.37±42.77	996.12±90.76
Uric acid (mg/lit)	Gr-I	47.62±10.44	28.36±5.62	61.87±8.20
	Gr-II	55.07±8.50	24.97±5.58	49.98±8.14

isolates of D22, D25, D26, D27 and except 3 (D27, D28, D30) all were negative for gelatin liquefacation test.

Isolation of anaerobic bacteria from faecal samples of Dromedary camels

From young Dromedary camels maintained on sole guar phalgati roughage ration, rumen liquor was collected and on incubation with specific cellulosic medium individual bacterial colonies were picked up and purified through restreaking and 18 isolates of fibre degrading anaerobic bacteria(R1 to R18) were selected. On morphological examination 16 isolates (R1 to R16) were found gram positive and were spherical in shape whereas 2 isolates (R17 and R18) were gram negative and short rods in shape.

Sugar utilization tests indicated that all the 18 bacteria isolates were able to utilize various sugars such as glycerol, arabinose, xylose, glucose, salicin, galatose, mannose, lactose, maltose, mannitol, sucrose, cellobiose, trehalose, starch, xylan and carboxy methyl cellulose. Except three isolates (R2, R4, R18), the rest 15 isolates gave positive raffinose sugar utilization test which warrants detailed study on metabololism of these three isolates. All the isolates were motile, produced gas and showed positive gelatin liquification and catalase test.

Growth of isolates were higher on cellobiose followed by glucose, CMC and xylan sugars Glucose level was measured in culture media after 24 hour bacteria growth. Glucose level was lower in case of isolates grown on CMC and xylan sugars as compared to those on glucose and cellobiose sugars In-vitro dry matter digestibility % of gaur straw by 7 isolates of R1, R2, R3, R4, R5, R7 and R8 after 48 hours incubation at 39°C was in the range of 50.42 to 53.32%

All the isolates from Bactrians and Dromedary camel rumen were subjected for Molecular characterization .DNA was isolated followed by 16S RNA gene amplification.

Camel Management

Adaptation of camel to changed climate in relation to temperature humidity index

In order to decide the optimum time of grazing for camels during hot summer months of April to September, 10 growing camel calves were divided into two equal groups. The group – I calves were sent for grazing during 1000hrs to 1600 hrs daily for 6 hours (as per the farm grazing management practice) whereas the group – II calves were sent for daily grazing during thermo neutral period i.e. 4 hours in early morning (06:00 to 10:00hrs) and 2 hrs in the late evening(17:00 to 19:00Hrs). After grazing the manger feeding with groundnut haulms *(Arachis hypogaea)* with guar crop residue *(Cyamopsis tetragonoloba)* in 50:50 ratio was done *ad libitum*. The climatic variables were recorded daily (April'12 toMarch'13), morning and evening time period at camel housing place.

The average daily gain and total body weight gain in calves sent for grazing during relatively cool parts of day (Group-II) was significantly ($P<0.01$) higher compared to group –I calves sent as per routine farm schedule (Table 27). The average intake of fodder and water from manger was higher in group I calves may be because the calves compensated their less intake from rangelands which might have been during hot part of the grazing activity done during day hours and while these animals were housed and were manger fed the group I calves during cooler part had higher intake of fodder than group II calves. The group II calves sent for grazing during cool hours of day might had sufficiently high intake from rangelands and obviously had less intake from mangers. The comparative biometrics of camel calves in different grazing management practices revealed that body length, heart girth, height at wither, neck length, leg length significantly ($P<0.01$)were higher in group II calves as compared to group I calves.

Analysis of recorded data of climatic parameters during experimental months revealed that April to June

Table 27: The growth performance of Camels in different grazing period management

Parameters	Unit	Group - I	Group - II
Av. Initial B.W	Kg	219.60 ± 12.40	223.80 ± 10.11
Av. B.W ** after 180 days	Kg	274.20 ± 12.36	291.20 ± 9.98
Total gain	Kg	54.60	67.40
Av. Growth rate **	g / Day	303.34 ± 69.18	374.45 ± 77.26
Av. Fodder Intake(manger)	Kg / day / Animal	4.87 ± 1.65	3.61 ± 1.92
Av. Water Intake(trough)	l / day / Animal	10.72 ± 1.68	10.11 ± 1.93
Economics of feeding			
Total feeding cost for 180 days for each practice.	Rs / group	35064	25992
Total feeding cost for 180 days.	Rs / animal	7012.8	5198.4
Total feeding cost	Rs / day / animal	38.96	28.88
B.C.R	Rs / Kg gain	128.44	77.12

** Significant at 1 %

months remain relatively hotter and mean value of maximum temperature (Fig. 22) was higher during June'12 month (46.4°c). The drop in temperatures is progressive from June upto Septemebr but generally the maximum temperature still remains 40^0 C and above in Sept-Oct. Months. Further the values of THI also were higher in monsoon and Post monsoon months hence the practice of sending Camel calves during relatively comfortable part of hot and hot humid months was successful in getting good growth. It drops at lowest level during Jan'13 (18.3°c) and it rises during Mar'13 (29.0°c). The average value of minimum temperature is lowest during Jan'13 (4.5°c) and highest during June1'12 (33.5°c). Dry bulb temperature and wet bulb temperature are recorded during morning and evening time and based on it relative humidity is calculated. The relative humidity varies greatly among the different months. It ranges from 37.7% to 67.0% during morning hours whereas during evening period it ranges from 8.7% to 45.3% from April'12 to Mar'13. The relative humidity is significantly ($P < 0.01$) higher during morning as compared to evening period for all months. Based on these variations climate are categorized into 3 broad categories Viz: hot dry, hot humid, cold dry climate. The great variation is found for THI value during different months. The THI is significantly ($P < 0.01$) lower during morning as compared to evening hours. The morning and evening variation is significant ($P < 0.01$) for all months in different climate from April'12 to Mar'13. The morning THI varies from 61.0 to 82.56 where as evening THI varies from 67.24 to 89.24 during these months (table-28).

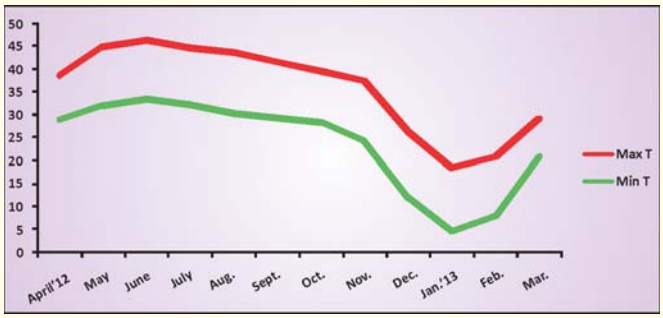


Fig. 22: Average Maximum and minimum temperature (°C) during different months

On studying the economics it was observed that the practice of grazing camel calves during cool hours remain profitable by looking at the weight gain characteristics of the calves.

Table28: Average value of Temperature humidity Index during different month and periods.

Sl No	Month	Temperature humidity Index		Climate
		Morning	Evening	
		**		
1	April2012	67.09	72.84	Hot Dry
2	May	70.44	76.74	
3	June	74.73	79.52	
4	July	79.11	85.01	Hot humid
5	Aug	80.43	87.76	
6	Sept	82.56	89.24	
7	Oct	78.14	86.53	
8	Nov	73.13	79.04	Cold dry
9	Dec	66.13	71.08	
10	Jan 2013	61.0	67.24	
11	Feb,2013	61.53	68.6	
12	Mar'2013	65.1	70.22	Hot Dry

** Significant at 1 % level.

Extension Activities

Different extension activities are carried out through collaboration with NGO namely Sahajeevan Sansthan, Bhuj, Kutch, Gujrat; ATMA Jaipur ; URMUL Trust and Dairy, Bikaner; KVK, Beechwal, Bikaner and SKRAU, Bikaner.

Exhibitions: There are 5 exhibitions are conducted at appropriate places. Viz: (1). At CAZRI, Jodhpur on 12.9.12 and achieved 1st prize, (2) At dhani Pandusar, Lunkaransar (Bikaner) on 24.8.12. (3) At International camel festival on 28.1.13, (4) At Lunkaransar on 17.3.13, (5) At CSWRI, Avikanagar on 23.3.13 and achieved 2nd prize. The camel tourism activities as TOT achieved excellence certificate by World trip advisor organization.

Agriculture Education Day: For 1st time various extension activities conducted during Agriculture Education Day to encourage young mind towards agricultural sciences on 5.12.12.

Scientist-farmer-extension interface meet: There are 5 meets conducted viz: (1) At Deshnok (rathi kuai ke pas) on 14.5.12, (2) At village Nubra, Leh, J & K on 19.8.12, (3) at dhani Pandusar, Lunkaransar (Bikaner) on 24.8.12, (4) at centre on 11.9.12, (5) at village Sam, Jaisalmer on 4.10.12.

Training: There are 3 training programme conducted Viz : (1) During farmer's training on "camel rearing business" on 14-18th January 2013 for 30 farmers with ATMA collaboration; (2) During farm innovator days on 11.9.12 for 50 farmers; (3) During agriculture education day on 5th December 2012 for 120 students. During April'12 to March'13, A total number of 465 farmers, 140 Agriculture supervisors, 2781 Students, 320 Scouts & guides from all over country have imparted training / demonstration / educational information by the centre, with financial support of 'agriculture technology and management agency (ATMA) project. In this field oriented training programme, 30 farmers of Jhunjhun district nominated by the State Animal Husbandry Department, Govt. of Rajasthan, were trained on various

aspects of camel husbandry covering camel breeding, health, nutrition and management. Programme also covered utilization of camels for draft and milk production as well as value addition to camel milk. Exposure was also given on equine and sheep husbandry practices. Training manuals and other extension materials were distributed to the farmers.

Ambulatory clinics: during the year a total of 36 visits were made in villages surrounding Bikaner. These villages included Bamblu, Dashnokh, Gigasar, Husansar, Jaimalsar, Kesar-desar-boran, Khajuwala, Pugal, Morkhana, Norang-desar, Rajera-hamera, Shobhasar and Surdhana. During these visits camel husbandry extension activities of management, breeding, nutrition and health care were provided to the farmers by the subject matter specialists.

Collaborative Research Achievement

Production of Single Domain Antibodies against Tuberculosis and Thyroid cancer-BARC, Mumbai

Two camels each were inoculated with respective antigens of Tuberculosis and thyroid cancer following standard protocol. The production of antibodies in the camel serum against hTg was confirmed by antibody titre. The PBMNCs were also collected from these animals from heparinised camel blood by Ficoll- hypaque method. 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 suitable primers. Tg-IRMA assay was also set up using the polyclonal Tg antiserum drawn from camel.

Validation of Health Benefit Claims of goat, camel, cow and buffalo milk – NDRI, Karnal

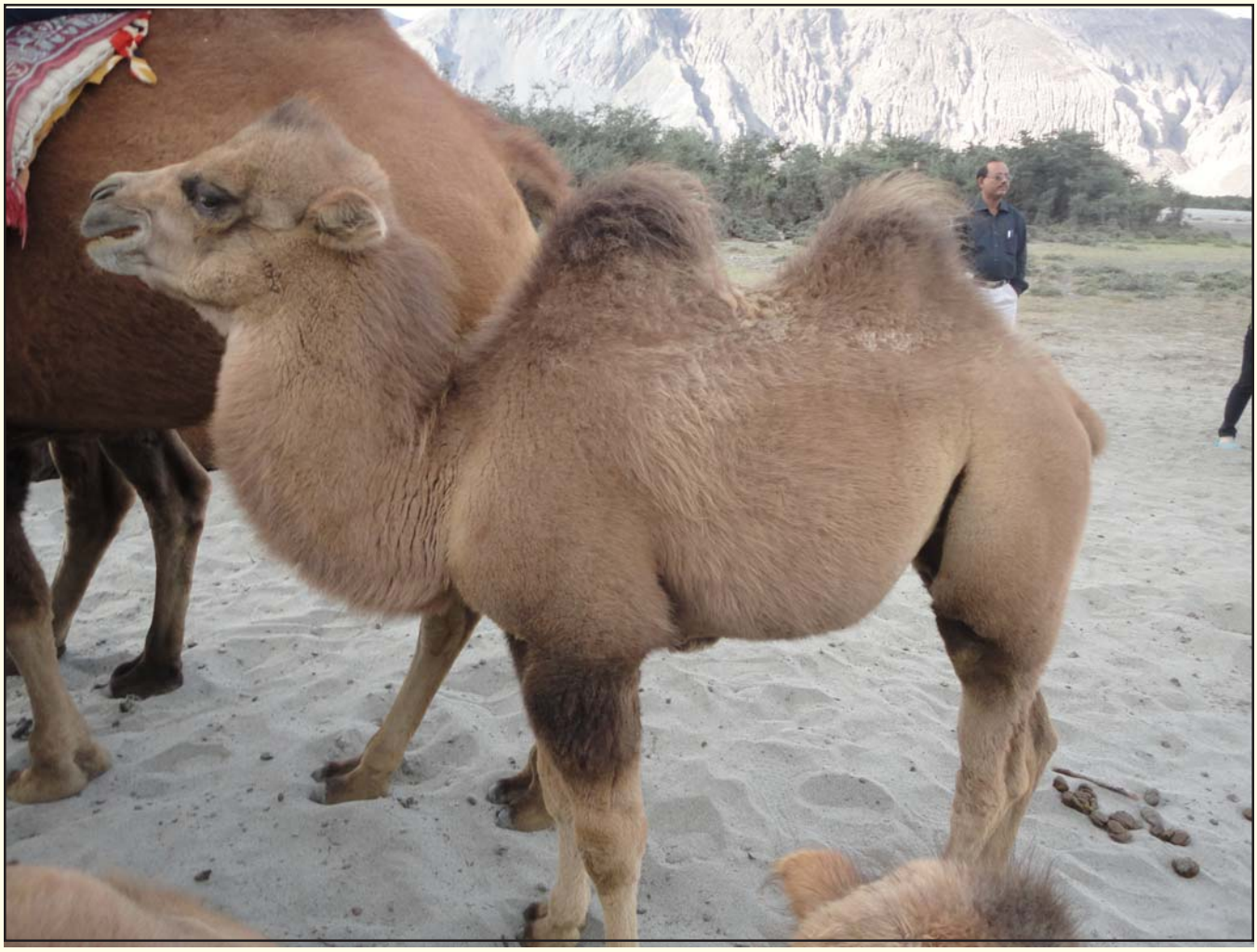
During the period, digestion of milk fat from goat, camel, cow and buffalo milk by pancreatic lipase was attempted. The action of lipase on triglycerides resulted in release of free fatty acids. Comparative information on the digestibility of goat, camel, cow and buffalo milk fat has been generated and the milk fat digestibility was in the order of (goat, camel) > (cow) > (buffalo). This suggests that camel and goat milk fat are easily digestible in comparison to cow milk fat and cow milk fat is easily digestible in comparison to buffalo milk fat.

Milk fat globules underwent flocculation, dissociation and coalescence during digestion with pancreatic lipase in the presence of bile extract. Using Confocal Laser Scanning Microscopy it is noted that milk fat digestion with lipase involves flocculation, dissociation and coalescence steps. Flocculation was extensively observed in buffalo milk, as compared to cow milk.

Molecular Characterization of Oligopeptidase B and Paraflagellar Rod (1 and 2) genes of *Trypanosoma evansi* Isolated from Camel (Ph.D. Thesis: Sanjay Kumar; RAJUVAS, Bikaner)

The present study was carried out to isolate the Oligopeptidase B, Paraflagellar Rod 1 and Paraflagellar Rod 2 genes of *Trypanosoma evansi* using PCR/RT-PCR, clone the amplicons in a suitable plasmid vector and then characterization of above genes through sequencing. After confirming *T. evansi* infection in suspected camel, the blood of camel was inoculated in Swiss albino mice for propagation of parasites. Blood of mice was collected from heart after dissecting the mice which had massive infection. DEAE cellulose chromatography was done for purification of trypanosomes from blood of mice. After DNA extraction from purified trypanosomes the desired amplicons of *opdB*, *pfr1* and *pfr2* genes were then amplified by PCR using gene specific. The amplicons of expected size were purified from the 1% low melting agarose gel employing illustra GFX PCR DNA and Gel Band Purification Kit. The DNA fragment of interest was then ligated to the pGEM- T Easy vector and ligated mixture was transformed into *Escherichia coli* JM109 strains. The cells containing recombinant plasmid could be identified on the basis of blue/white colony selection on LB agar

containing X-Gal, IPTG and ampicillin. Screening of recombinants was done by Restriction Enzyme digestion of plasmid DNAs using *Eco*RI and found that the release of DNA fragments around 2092 bp for *opdB*, 1769 bp for *pfr1* and 1767 bp for *pfr2* gene. Colony PCR was done for quick screening of plasmid inserts directly from *E. coli* colonies in the presence of insert specific primers. After confirmation of clones of *opdB*, *pfr1* and *pfr2* genes the plasmid DNAs were sequenced and coding sequences of *opdB*, *pfr1* and *pfr2* genes according to the results obtained were of 2092 bp, 1769 bp and 1767 bp, respectively. The phylogenetic and sequence analysis was done by use of Clustal X and MEGA5 softwares. Tree topology was based on the Neighbor-Joining method and maximum parsimony with 100% bootstrap values. Multiple sequence alignment of obtained protein sequences of *opdB*, *pfr1* and *pfr2* genes was performed with Clustal W (Clustal 2.1) at EBI. Identified *opdB*, *pfr1* and *pfr2* gene sequences showed a close homology with other *Trypanosoma* and *Leishmania spp*. gene sequences. 3D structure model of obtained opdB, pfr1 and pfr2 proteins have been determined by using homology modeling protocol.



4. Technology Assessed and Transferred

1. Development of functional camel milk products

The following camel milk products have been developed during the year

Spray dried camel milk products

A total of 25 samples of spray dried camel milk powder produced. Two parameters, fat % and heating temperature were considered for production of different batches of camel milk powder. The moisture and protein content of the powder samples ranged from 3.00-8.02 and 21.44 to 30.36,respectively. The acidity of the milk samples ranged from 1.44-1.8.

Yoghurt with improved texture

The whole camel milk was boiled and 12% camel milk chhana was added and allowed cooling up to 35-37°C and 1% starter culture was added. It was well mixed and kept at 30°C for fermentation in BOD incubator. Total solids after mixing chhana with boiled camel milk were between 14.75-5.50%. Initial pH was 6.00-6.06 and after 16h incubation it was 4.19-4.23. The texture of the yoghurt was found improved.

Camel milk whey enriched drink

Whey obtained after making the chhana was mixed with cumin powder and salt was added to taste. Sensory properties of the whey beverage were found to be very good. The pH and protein (%) of the whey beverage was between 5.60-5.62 and 1.10-1.19, respectively. No froth formation was observed when it was concentrated at temperature ranges 55-70°C in rotary evaporator. Hence whey was allowed to concentrate nearly to half of its original volume to enrich it with high protein. The protein (%) in concentrated whey beverage was between 2.22-2.30%.

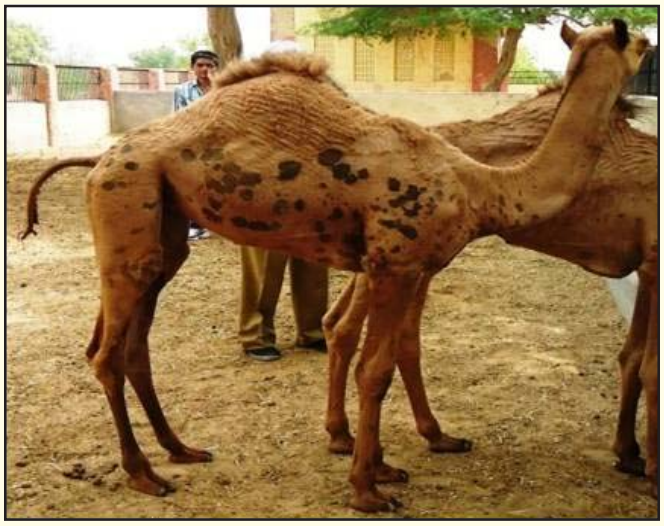
Acidophilus milk

In order to improve the utility and functionality of camel milk, attempts were made to develop acidophilus milk, a probiotic milk product from camel milk. Whole camel milk was boiled for 5 minutes and sugar was added at a level of 10% and then it as cooled to 40±2°C and then fresh culture of *Lactobacillus acidophilus* was added at 2% and incubated at 37±2°C for 14hr. the fermented product thus obtained were cooled; homogenized and rose essence were added. The

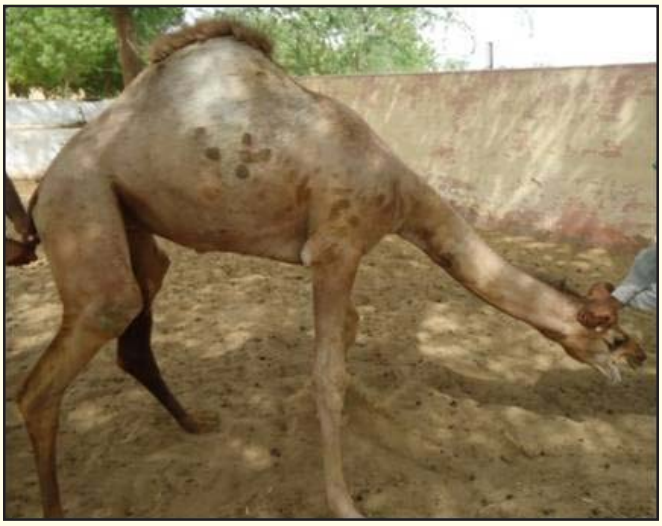
fermented product was packed aerobically in LDPE bags and stored in refrigerator. The product was also subjected for sensory evaluation score which was more than 8 on hedonic scale.

2. Treatment of skin candidiasis

Therapeutic potential of three formulations consisting of 2% potassium iodide(T1); 6% sulphur in mustard oil(T2); and 6% sulphur and 3% salicylic acid in mustard oil(T3) were evaluated topically in natural occurring cases of skin candidiasis in camel calves. All the three treatments were found effective with almost similar application schedule but with variable duration of treatment. The present study offers to minimize losses in young camel calves due to skin candidiasis.



Calf (T_1) after 72 hrs. of 1st treatment



Calf with lesions before recovery phase

Completely recovered calf

5. Education, Training and Awards

International

Dr. N.V. Patil attended a training programme entitled, "Leadership Decision Making: Optimising Organisational Performance" by Harvard Kennedy School, Cambridge, MA, USA under the sub-project 'Learning & Capacity Building' under Component-1 of NAIP from October 28 – November 02, 2012.

National

Dr. N.V. Patil attended training on "Executive Development Programme on Leadership Development" at NAARM, Hyderabad from December 17-21, 2012.

Dr. D. Suchitra Sena attended training on "Assessment of microbial diversity by Next Generation Sequencing for taxonomic and metabolic reconstruction of gut microbes" at NIANP, Bangalore from 22nd August to 4th September, 2012.

Dr. D. Suchitra Sena attended TOT programme on National Animal Disease Reporting System (NADRS) at NIC, New Delhi from 17th to 21st December, 2012.

Dr. Nirmala Saini attended training on Communication and presentation skill (CAPS at Institute of management training and research (IMTR), Goa from November 19 to 23, 2012.

Dr. Shirish Narnaware attended training on Communication and Presentation Skills at Institute of management training and research (IMTR), Goa from November 19 to 23, 2012.

Awards

Awarded 1st Prize for best stall for team of NRCC in Kisan Mela held at CAZRI, Jodhpur on 12th August, 2012.

Awarded 2nd Prize for best stall of NRCC in Sheep mela and Kisan Goshthi organized on 23rd March, 2013 at CSWRI, Avikanagar.

Sh. Mohan Singh (T-5) awarded to represent 17th international Master Athletics Championship, Taipei, Taiwan from 2.11.2012 to 7.11.2012 and secured 4th and 6th place in Shot put and Discus throw, respectively.

Sh. Mohan Singh (T-5) Awarded first and third prizes in Shot put and discus throw respectively in the ICAR Inter Institutional Sports Tournament held during 18.01.2013 to 21.01.2013 at IARI, New Delhi.

In ICAR West Zone Sports Tournament held at Bikaner from 28th February to March 3rd, 2013 by NRCC,Bikaner following awards were received by NRCC:

Discus throws	:	1st Prize Sh. Mohan Singh
Shot put	:	1st Prize Sh. Mohan Singh
Volley Ball Shooting	:	Winner Trophy
Badminton	:	Runner Trophy

6. Linkages and Collaborations

Collaborative University/Institute	Programme
National	
National Dairy Research Institute (Deemed University), Karnal, Haryana	Validation of Health Benefit Claims of goat, camel, cow and buffalo milk
Rajasthan University of Veterinary and Animal Sciences, Bikaner	M.V.Sc. and Ph.D. Research work.
Maharaja Ganga Singh University, Bikaner	Ph.D. Research work
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
Sahjeevan Trust , Bhuj, Gujarat	Extension of camel husbandry practices
Lokhit Pashu Palak Sansthan, Sadri, Pali	Extension of camel husbandry practices
Sardarkrushinagar Dantiwada Agricultural University, Sardar Krushinagar	Ph.D. Research work
Institute of Pesticide Formulation Technology, Gurgaon	Collaborative Research Project
Banasthali Vidyapeeth, Jaipur	Ph.D. Research work
International	
Sardar Krushinagar Dantiwada Agricultural University	Ethiopian student -Ntiranyibagira Emmanuel for Ph.D.Work


राष्ट्रीय उष्ट्र अनुसंधान
National Research Centre on Camel, Bikaner
Brain Storming Meet
on
Trypanosomiasis in Camels
6th March 2013

7. List of Publications

Research Papers Published

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Shrikant Sharma, Raghvendar Singh, and Shashank Rana (2012). *"A short note-metagenomics"*. International Journal of Biomedical Research, 3(4):181-186.

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Dan, H., Murdia, C. K., Mehta, S.C. and Yadav, S.B.S. (2013). Genomic organisation of promoter regions of alpha-lactalbumin in camel. Presentation in the X National Symposium on "Integrated development of vast biodiversity of indigenous livestock for long term rural livelihood security Organised by G.B.Pant University of Agriculture and Technology, Pantnagar, Uttarakhand and Society for conservation of domestic animal biodiversity, Karnal at Pant nagar on February 7-8, 2013.

Dan, H., Murdia, C.K., Mehta, S.C., Yadav, S.B.S., Singh, H. and Vivekanand. (2013). Genomic organisation of promoter regions of beta-casein gene in camel. Presentation in the X National Symposium on "Integrated development of vast biodiversity of indigenous livestock for long term rural livelihood security Organised by G.B.Pant University of Agriculture and Technology, Pantnagar, Uttarakhand and Society for conservation of domestic animal biodiversity, Karnal at Pant nagar on February 7-8, 2013.

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Poonia, R.K., Suchitra Sena, D., Meera Srivastava and Patil, N.V. Non-protein nitrogen and protein degrading enzymatic changes in c_1 compartment fluid of camels fed different diets. 8th Biennial Animal Nutrition Association Conference, RAJUVAS, Bikaner, November 28th–30th, 2012

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Gene sequence submission to NCBI database: Nagarajan, G., Swami, S.K., Dahiya, S.S., Narnaware, S.D., Tuteja, F.C., Sharma, G., Mehta, S.C., Singh, R., Patil, N.V. Dromedary camel HSP70 AIB gene. KC616314

हिन्दी लोकप्रिय लेख अथवा पाठ्यक्रम

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8. List of Ongoing Projects

S.No.	Project Code	Project Title	PI/Co-PI	Duration
1.	AGB-7	Genetic improvement of milk production potential of Indian dromedary	S.C. Mehta, U.K.Bissa	2007-13
2.	AGB-8	Genetic evaluation of performance of Indian camel	U.K. Bissa, K.Nath	2011-14
3.	AGB-9	Structural analysis of 5'Flanking region of dromedary milk protein gene(s)	S.C. Mehta, S.S. Dahiya	2011-14
4.	AN-5	Enhancing nutrient utilization and reducing methane emission	A.K.Nagpal, D.S.Sena, U.K.Bissa, N.Sharma, N.V. Patil	2009-13
5.	AN-6	Evaluation of feed pellets containing different protein levels in male growing camel calves	AK Nagpal	2011-13
6.	AN-7	Assessment of Nutritional status of lactating camels for improving production performance	N. Saini, N.V. Patil	2011-13
7.	AP-6	Adaptation of camel to climate change in relation to temperature humidity index	C. Bhakat, G. Nagarajan	2009-14
8.	AP-7	Physiological and performance adaptability of camel under hot arid environment having different body scores (BCS)	S. Singh, N.V.Patil, K. Nath	2011-14
9.	AR-5	Improving the efficiency of artificial insemination in camel using existing and emerging technologies	S.Vyas, G. Mal	2008-13
10.	AB-1	Production and evaluation of bioactive compounds from indigenous camel milk products	Raghvendar Singh, D. Kumar, S.K. Ghorui, G. Nagarajan	2012-15
11.	LPT-1	Standardization of membrane process for development of functional camel milk food	D. Kumar, Raghvendar Singh	2010-13
12.	VM-8A	Epidemiology of bacterial and fungal diseases of camel	F.C.Tuteja, S.S.Dahiya, S.D.Narnaware	2007-13
13.	VM-8B	Epidemiology Prevalence of parasitic diseases of camel	S.K. Ghorui	2007-12

S.No.	Project Code	Project Title	PI/Co-PI	Duration
14.	VM-8C	Epidemiology of Viral diseases of Camels	G. Nagarajan, S.S. Dahiya	2007-13
15.	VM-12	A pilot study on the Gut/Digestive tract metagenomics of camel	D.S. Sena, N.V. Patil, Raghvendar Singh	2012-13
16.	BT-AS(1)	Molecular characterization of cameline cytokine gene(s)	G. Nagarajan, S.K. Ghorui	2007-12
17.	BT-AS-3	Characterization of Toll-like Receptors (TLR) in Camel	S.S. Dahiya, G. Nagarajan	2012-13
18.	VPH-1	Investigations on clinical cases for overall health improvement of camel herd	S.D Narnaware, F.C.Tuteja, S.K.Ghorui, B.L.Chirania, C.Bhakat	2010-13
19.	VP-2	Management of GI Parasites in camel herd and molecular characterization of anthelmintic resistant strains of parasites	S.K. Ghorui, S. Kumar	2008-11

Inter-institutional and externally funded projects

S.No.	Project Code	Project Title	PI/Co-PI	Duration
1	VTC (NAIP)	Network programme on Veterinary type culture- Rumen microbes (lead centre NIANP, Bangalore/NRCE, Hissar)	AK Nagpal, D.S.Sena, F.C. Tuteja, N.V. Patil	2009-12
2	AICRP	Improvement of feed resources and nutrient utilization in raising animal production	N. Saini, S.Vyas	2003-12
3	AR-7	Phero-chemical analysis in the urine of dromedary camel (*Camelusdromedarius*)- IPFT, Gurgaon	S. Vyas, S. Alam (IPFT)	2011-13
4	NAIP	Bioprospecting of genes and allele mining for heat and cold stress tolerance in Indian dromedaries (*Camelusdromederius*)	G. Nagarajan, S.S.Dahiya, S.C.Mehta	2009-14
5	BT-AS-2-	Development of single domain antibodies for diagnosis/therapy- inter institutional project- BARC Mumbai	Venugopal, M.Venkatesh, S.K. Ghorui, G. Nagarajan	Since 2007
6	D-32	Validation of Health Benefit Claims of goat, camel, cow and buffalo- NDRI, Karnal, Haryana	Sunita Meena, Y.S. Rajput, Rajan Sharma, R. K. Sharma, Raghvendar Singh	2012-2014

9. QRT, IMC, RAC and IRC Meetings

Fifth Quinquennial Review Team (QRT)

The fifth Quinnquennial Review Team (QRT) reviewed activities of National Research Centre on Camel, Bikaner, Rajasthan, for the year 2007-2012. The composition of the team is as follows.

Sl . No.	Name and Address of the Expert	Status
1	Dr. S.P.S. Ahlawat, Ex–Director, IVRI,NBAGR,CARI & Ex-Vice Chancellor,Ujjain university	Chairman
2	Dr. S.B.S. Yadav, Professor., RAJUVAS, Bikaner- 334 001	Member
3	Dr. J. R. Rao, Emeritus Scientist,National Academy of Agricultural Research Management, Rajendra Nagar, Hyderabad – 500 030	Member
4	Dr. G.R. Purohit, Ex-Dean, RAJUVAS,Bikaner	Member
5	Dr. D. Kumar, Professor, Veterinary Parasitology, Rajiv Gandhi College of Veterinary and Animal Science, Kurumbapet, Puducherry- 605 009	Member
6	Dr. J. V. Solanki, Emeritus Scientist,AAU, Anand -388 001.	Member
7	Dr. Ilse Kohler-Rollefson, Lokhit Pashu Palak Samiti,Sadri, District Pali - 306 702	Member
8	Dr. Sumant Vyas, Senior Scientist, NRC on Camel, Bikaner	Member - Secretary

After detailed presentation by scientists of NRCC the discussions were held with technical, administration and other staff of centre.. The major recommendations were included in the final draft of the report which was submitted to the Secretary, ICAR & Director General, ICAR in a meeting held at the ICAR headquarters on 5th February, 2013.

Research Advisory Committee

The RAC meeting of NRCC, Bikaner was held on May 8th, 2012 at 11.00 AM. Dr. B.C. Patnayak, Dr. J.R. Rao, Dr. D. C. Joshi , S.B.S. Yadav, A.K. Rawat, Dr. A.K. Purohit, N.V. Patil, Sh Shankar Ji Reibari and Dr. Sumant Vyas particiapted in the meeting and all concerned scientists presented the salient achievements of their respective projects. The work done in the Centre in the past and the progress on present research projects was reviewed and recommendations for future line of research were proposed.

Institute management Committee

Institute management Committee (IMC) meetings of NRCC were held on 10.05.2012 and 30.01.2013. Dr. N.V. Patil, Sh. Shankar Rebari, Dr. A.K.Patel, Dr Raghvendar Bhatta, Dr. R.C.Sharma, Sh V.K. pandey were present in the first meeting and except Dr. Raghvendar Bhatta all above members were present in the second meeting too.

IRC Meeting

The Institute Research Council (IRC) meeting of NRCC for the year 2012-13 was held on 3rd May, 2013 and new, ongoing and completed research projects were discussed, progress was assessed and necessary suggestions were given.

10. Participation in Conferences, Meetings, Workshops and Symposia

Name	Conferences, meetings, workshops, symposia	Date
Dr. N.V. Patil	NICRA and AS Division meet at New Delhi	April 27, 2012
	Meeting of Animal Nutrition Group at NRCE, Hisar	May 05, 2012
	Committee meeting on "Updation of Nutrient requirements" at NIANP, Bengaluru	May 21-22, 2012
	Meeting with Legal Advisor, ICAR, New Delhi	June 06, 2012
	ICAR Regional Committee meeting at Palampur	June 08-09, 2012
	BOM Meeting, RAJUVAS, Bikaner	June 17, 2012
	NICRA Project Meeting under the Chairmanship of Hon'ble DG at ICAR, New Delhi	July 03, 2012
	Scientist-Farmer-Extension Interface meet of Department of Animal Husbandry at Diskit, Laddakh J&K	August 19, 2012
	Knowledge Meet at NASC, New Delhi under the chairmanship of Hon'ble D.G. Diskit, Laddakh J&K	August 21-22, 2012
	Member, Advisory Board, ASRB, New Delhi	September 03-4, 2012
	BOM Meeting, SK RAU, Bikaner at Udaipur	September 09, 2012
	Member, Selection Committee, ASRB, New Delhi	September 18,19 and 26, 2012
	Interactive Meet with Camel Rearing People of Jaisalmer and QRT	October 04, 2012
	Animal Science Directors' meet under the chairmanship of Hon'ble DDG (AS) at New Delhi	October 15, 2012
	XXII ICAR Regional Committee Meeting at CAZRI, Jodhpur	November 16, 2012
	Meeting to discuss the implementation of NICRA Project on Goats at CIRG, Makhdoom	November 30, 2012
	BOM Meeting at RAJUVAS, Bikaner	December 07, 2012
	RFD meeting under chairmanship of Hon'ble DG at New Delhi	January 10-11, 2013
	Chairman, technical session in Scientist-Farmer interaction meet at KVK, CAZRI, Bhuj	January 16, 2013
	Meeting at ASRB, New Delhi	January 22, 2012
	QRT Meeting with Hon'ble DG, Chairman QRT and others	February 04-05, 2013
	Directors,AS Division /Regional Station Heads Meeting with Hon'ble DG and DDG(AS)	March 04, 2013
	Directors' Meet at NASC, New Delhi	March 19-20, 2013
	Symposium on "Managing Stress in Drylands under Climate Changes Scenarios" at CAZRI, Jodhpur	December 01-02, 2012

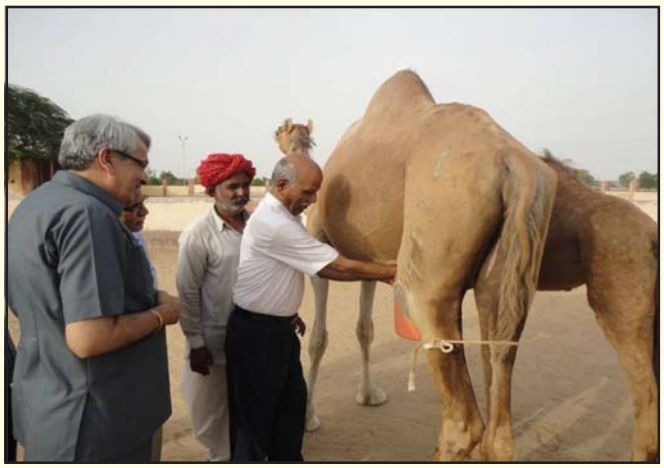
Name	Conferences, meetings, workshops, symposia	Date
	National Conference on "Use of Animals and Alternatives in Biomedical Research with emphasis on Drug Development" at University of Rajasthan, Jaipur	December 14, 2012
	National Seminar on ""Future challenges and opportunities to improve health and production of small ruminants" at CIRG, Makhdoom.	December 22, 2012
	XX Annual Convention of Indian Society of Animal Production and Management Conference at NDRI, Karnal	January 29, 2013
	8th Biennial Animal Nutrition Association Conference on "Animal Nutrition Research Strategies for Food Security" at RAJUVAS, Bikaner .	November 28-30, 2012
Dr. S.K.Ghorui	XXIII National Congress of Veterinary Parasitology held at Assam Agricultural University, Khanapara, Guwahati	December 12 -14, 2013
	Seminar on "Emergence of Drug resistance against microbes".	April 30, 2012
	Scientist-Farmer-Extension Interface meet of Department of Animal Husbandry at Diskit,Laddakh J&K	August 19, 2012
	Brain storming meet on "Trypanosomiasis of camel in impending climate change scenario"	March 5, 2013
Dr. S.C.Mehta	National Knowledge Network Annual Workshop organised by National Informatics Centre at IIT, Bombay	October 31- November 1, 2012
	X National Symposium on "Integrated development of vast biodiversity of indigenous livestock for long term rural livelihood security G.B.Pant University of Agriculture and Technology, Pantnagar, Uttarakhand	February 7-8, 2013
Dr. A.K.Nagpal	8th Biennial Animal Nutrition Association Conference on "Animal Nutrition Research Strategies for Food Security" at RAJUVAS, Bikaner	November 28-30, 2012
	आत्मा परियोजना तहत उष्ट्र पालन व्यवसाय प्रशिक्षण as trainer at NRCC	January 17-18, 2013
	National Symposium on buffalo for sustainable food security held at Assam Agricultural University, Khanapada, Guwahati	March15-16, 2013
Dr Raghvender Singh	Meeting organised by ICAR HQ at NAAS complex N Delhi regarding technologies for trainings to end users.	October 08, 2012
	Interactive Meet with Camel Rearing People of Jaisalmer and QRT	October 04, 2012
	Farmers innovation Day at NRCC Bikaner	September 11, 2012.
	Farmers innovation Day at NRCC, Bikaner	September 11, 2012.
	आत्मा परियोजना तहत उष्ट्र पालन व्यवसाय प्रशिक्षण as trainer at NRCC, Bikaner	January 17-18, 2013
Dr F C Tuteja	Participated in Brain storming session on Mastitis Management in Dairy Animals organized by National Academy of Agricultural Sciences at NASC, N. Delhi	October 31, 2012
	आत्मा परियोजना तहत उष्ट्र पालन व्यवसाय प्रशिक्षण, रा.ऊ.अनु.के., बीकानेर	January 14-18, 2013
Dr Champak Bhakat	National seminar on "New paradigms in livestock production: from traditional to commercial farming and beyond and xx th annual convention of ISAPM, at NDRI, Karnal"	January 28-30, 2013

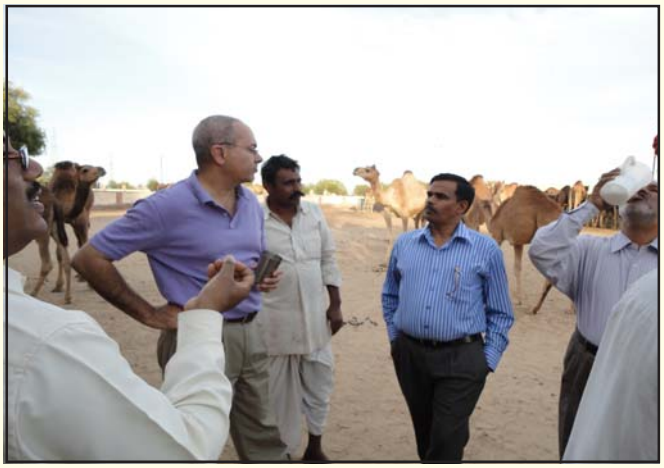
Name	Conferences, meetings, workshops, symposia	Date
	8th Biennial Animal Nutrition Association Conference on "Animal Nutrition Research Strategies for Food Security" at RAJUVAS, Bikaner	November 28-30, 2012
	National Symposium on Managing stress in dry land under climate change scenarios. AZRAI, CAZRI, Jodhpur	December 1-2, 2012
	International conference on Extension Education in the perspectives of advances in the NaRMA-IV, at SKRAU, Bikaner	December 19-21, 012
	Workshop on "Targeting climate resilient agricultural technologies in arid western India" organized by CAZRI, Jodhpur	March 14-15, 2013
	Agriculture Education Day, NRCC, Bikaner	December 5, 2012
	Scientist-Farmer-Extension Interface meet of Department of Animal Husbandry at Diskit,Laddakh J&K	August 19, 2012
	Scientist-farmer-extension interface meet: (1) At Deshnok (2) At village Hunder,Nubra, Leh, J & K, (3) At dhani Pandusar, Lunkaransar (Bikaner) (4) At centre (5) At village Sam, Jaisalmer	 May 14, 2012 August 19, 2012 August 24, 2012 Sept. 11, 2012 October 4, 2012
	आत्मा परियोजना तहत उष्ट्र पालन व्यवसाय प्रशिक्षण, रा.ऊ.अनु.के., बीकानेर	January 14-18, 2013
	Farmers innovation Day at NRCC Bikaner	September 11, 2012
Dr. D. Suchitra Sena	World Veterinary Day at NRCC, Bikaner and RAJUVAS, Bikaner	April 30, 2012
	World Congress on Biotechnology, 2012, Leonia International Convention Centre, Hyderabad	May 4-6, 2012
	8th Biennial Animal Nutrition Association Conference on "Animal Nutrition Research Strategies for Food Security" at RAJUVAS, Bikaner	November 28-30, 2012
	Agriculture Education Day, NRCC, Bikaner	December 5, 2012
	आत्मा परियोजना तहत उष्ट्र पालन व्यवसाय प्रशिक्षण, रा.ऊ.अनु.के., बीकानेर	January 14-18, 2013
	Farmers innovation Day at NRCC, Bikaner	September 11, 2012
	केन्द्र की राजभाषा इकाई द्वारा आयोजित सभी कार्यशाला	September 17, 2012 March 30, 2013
Dr. N. Saini	Animal Nutrition Research Strategies for feed security from by RJUVAS, Bikaner	November 28-30, 2012
	International conference on "Extension education in perspectives of advances in natural resources management in agriculture" (NaRMA- IV) from at Swami Keshwan and Rajasthan Agriculture University, Bikaner, Rajasthan, India.	December, 19-21, 2012
	International conference of " sustainability of camel population and production " College of Agricultural and Food sciences , King Faisal University, Saudi Arabia	February 17-20, 2013
	Meeting of QRT of AICRP 2007-2012 at CSWRI, Jaipur (Rajasthan)	September 7-8, 2012

Name	Conferences, meetings, workshops, symposia	Date
	Meeting of AICRP at NASC, Delhi	March 21-22, 2013
Dr. G Nagrajan	आत्मा परियोजना तहत उष्ट्र पालन व्यवसाय प्रशिक्षण, रा.ऊ.अनु.के., बीकानेर	January 14-18, 2013
	Farmers innovation Day at NRCC, Bikaner	September 11, 2012
Dr. Shyam	System Biology, at IIIT, Allahabad	March 16-17, 2013
Singh Dahiya	Camel Festival 2013, Bikaner	January 26-28, 2013
	Kisan Mela at CAZRI, Jodhpur	August 12, 2012
	Sheep mela and Kisan Goshthi on at CSWRI, Avikanagar (Rajasthan)	March 23, 2013
Dr. Shirish	Farmers innovation Day at NRCC Bikaner	September 11, 2012.
Narnaware	आत्मा परियोजना तहत उष्ट्र पालन व्यवसाय प्रशिक्षण as trainer at NRCC, Bikaner	January 17-18, 2013
	केन्द्र की राजभाषा इकाई द्वारा आयोजित सभी कार्यशाला	September 17, 2012 March 30, 2013

11. Distinguished Visitors, Appreciation and Awards

S. No.	Date	Name and Address
1.	15.05.2012	Air Commander R Shanhar, DDG NCC Dept.Jaipur , Rajasthan.
2.	26.7.2012	Mr Abhimanyu Kumar,IAS, HCM RIPA, Jaipur, Rajasthan
3.	26.07.2012	Dr. K. S Khokhar,Vice Chancellor,CCSHAU, Hisar, Haryana
4.	23.08.2012	Mr Mumtaz Masih, Chairman, Redressal of Public Grievances, Government of Rajasthan
5.	16.10.2012	Prof. Dr. R. N. Sreenivas , Ex- Vice Chancellor, KVAFSCL, Bidar, Karnataka
6.	02.11.2012	Justice P. K. Dey , West Bengal Land Reforms Department, Kolkata, WB
7.	7. 11.2012.	Her Excellency Dr.(Mrs) Margrat Alwa, Governor, Govt of Raj. , Bhawan, Jaipur, Rajasthan.
8.	18.11.2012	Dr. N. K. Krishna Kumar, DDG(Horticulture) ICAR, New Delhi
9.	21.2.2013	Justice V.K Dixit, Judge Allahabad High Court, Lucknow bench, UP
10.	26.3.2013	Vivek Fellner and Kelly Zering, Carolina State University, USA.





12.Personnel

DIRECTOR

Dr. N.V. Patil

PRINCIPAL SCIENTISTS

Dr. S.K.Ghouri, Veterinary Parasitology

Dr. S.C.Mehta, Animal Genetics & Breeding

Dr. R. Singh, Animal Bio-Chemistry

Dr. Sumant Vyas, Animal Reproduction

Dr. A.K.Nagpal, Animal Nutrition

Dr. Sajjan Singh, Animal Physiology

SENIOR SCIENTISTS

Dr. F.C.Tuteja, Veterinary Medicine

Dr. Champak Bhakat,
Livestock Production Management

Dr. D.Suchitra Sena, Veterinary Medicine

Dr. Nirmala Saini, Animal Nutrition

Dr. U.K.Bissa, Animal Genetics & Breeding

SCIENTISTS

Dr. G. Nagarajan, Animal Bio-technology

Dr. Sanjay Kumar, Veterinary Parasitology
(Joined after completion of study leave)

Dr. N. Shrish Dadarao, Veterinary Pathology

Dr. Devendra Kumar, Livestock Products Technology
(On Study leave)

Dr. Shyam Singh Dahiya, Veterinary Microbiology

Dr. Shivkumar,Veterinary Pathology(Resigned the post)

TECHNICAL OFFICERS

Dr. N. Sharma, LSF, T – 9

Sh. Ram Kumar, Farm Manager, T-9

Dr. B.L. Chirania, Sr. Veterinary Officer, T-9

Sh. Dinesh Munjal, Technical Officer, T-7/8

Dr. Kashi Nath, Veterinary Officer, T-6

Sh. Ram Dayal Raigar, Technical Officer, T-6

Sh. M.K. Rao,Technical Officer, T-6

Sh. Nemi Chand, Technical Officer, T-6

Sh. Mohan Singh, Technical Officer, T-5

Sh. Nand Kishore, Technical Officer, T-5

Sh. Manjeet Singh, Technical Officer, T-5

Sh. Ram Chandar, Technical Officer, T-5

ADMINISTRATION STAFF

Sh. V.K. Pandey, Admin. Officer

Sh. K.P.Sharma,Asstt Admin.officer
(On deputation to Ministry of Water Resources)

Sh. A.K. Yadav, Asstt. Admin. Officer

Sh. Ram Kumar Suri, P.S.

Sh. B.K. Acharya, Asstt. Fin. & Acc. Officer
(Joined on 08 March, 2013)

13. Infrastructure Development

1. Renovation of Research laboratory block

Renovation work of the of Research laboratory block was completed at the cost of Rs.27.68 lakhs to smoothen the research facilities.

2. Renovation of Nutrition laboratory

Renovation of Nutrition laboratory was completed at the cost of Rs.42.72 lakhs and the same is being converted to Central Instrumentation Facility to provide accessibility to precision and advanced equipment facility to all the scientists of centre as well as for sister ICAR institutes.

3. Provision of High Mast Light

High mast lights were installed at the cost of Rs 8.25 lakhs in order to improve vigilance in supervision and management of camels, agricultural farm and infrastructure available in the campus.

4. Construction of Tubewell

One tube well facility was created at the cost of Rs.7.66 lakhs in Agricultural Block No2 which was essentially required to meet the requirement of maintenance agriculture farm.

5. Strengthening of Research Labs

The instruments purchased this year included Barcode Scanner, PCR, Centrifuge, Electrophoresis, Micropipettes, Kjeldahl assembly etc. which were required for the strengthening of different laboratories to cater the need ongoing research work. The total amount of Rs. 6.78 lakhs from plan and non plan funds were utilized.

6. Guest House Extension

The present guest house facility being extended by undertaking work of new construction of 4 VIP Rooms along with one living room through CPWD.

7. Camel Paddock Shed

Two open camel sheds in the available Paddocks are to be provided for which amount of Rs. 4.98 lakhs was deposited with CPWD.

8. Over Head Water Tank Along with Storage Tank and Pump Room

In order to cater the essential need of the animals, laboratories, farm facilities -the overhead water tank facility with underground storage and pump room facility is to be constructed by CPWD for which first installment of Rs21/- lakhs was deposited.


के ट्यूबवैल का शुभारम्भ
माननीय प्रो. के. एम. एल. पाठक
उप-महानिदेशक (पशु विज्ञान), भारतीय कृषि अनुसंधान परिषद्, नई दिल्ली
के कर कमलों द्वारा दिनांक 25.09.2012 को सम्पन्न हुआ।
डॉ. एन. वी. पाटिल
निदेशक

14. केन्द्र की राजभाषा सम्बन्धी गतिविधियाँ

हिन्दी पखवाड़ा–2012 : हिन्दी दिवस, 2012 के शुभ उपलक्ष्य पर केन्द्र निदेशक डॉ. नितीन वसन्तराव पाटिल द्वारा दिनांक 11–25 दिसम्बर तक हिन्दी पखवाड़ा मनाए जाने की विधिवत् घोषणा की गई। डॉ. पाटिल ने कहा कि हिन्दी पखवाड़ा उत्साही व मनोरम वातावरण में आयोजित किया जाए व इसमें सभी की भागीदारिता सुनिश्चित की जाए। सम्माननीय श्री शरद पवार, कृषि एवं खाद्य प्रसंस्करण उद्योग मंत्री, भारत सरकार द्वारा हिन्दी दिवस, 2012 संबंधी प्राप्त प्रेरणाप्रद 'संदेश' को केन्द्र के मुख्य भवनों पर लगाया गया। डॉ. एस. अय्यप्पन, माननीय सचिव एवं महानिदेशक, डेयर एवं भाकृअनुप द्वारा जारी अपील का वाचन किया गया। इस दौरान निम्नलिखित गतिविधियाँ आयोजित की गईं :

(1) हिन्दी में आशुभाषण प्रतियोगिता : विजेता प्रतिभागी

वर्ग अ	ब एवं स वर्ग	वर्ग द
प्रथम–डॉ. सुमन्त व्यास	श्री हरपाल सिंह	श्री सुखेदव प्रजापत
द्वितीय–डॉ. उमेश कुमार बिस्सा	श्री अविनाश कुमार	
तृतीय–डॉ. सज्जन सिंह	श्री सतनाम सिंह	
प्रोत्साहन–डॉ. चंपक भकत	डॉ. दाऊलाल बोहरा	

आशुभाषण प्रतियोगिता में प्रतिभागी विचार प्रस्तुत करते हुए

(2) हिन्दी में निबन्ध प्रतियोगिता : विजेता प्रतिभागी

वर्ग अ, ब एवं स	वर्ग द
प्रथम–डॉ. बलदेव दास किराडू	श्री राजेश कुमार
द्वितीय–डॉ. देवेन्द्र कुमार	श्री दुर्गासिंह
तृतीय–डॉ. राकेश कुमार पूनियाँ	श्री माणक लाल किराडू
प्रोत्साहन–श्री वी.के. पान्डे	

(3) राजभाषा कार्यशाला

राजभाषा कार्यशाला में अतिथि वक्ता श्रीमान सुनील बोड़ा, वरिष्ठ व्याख्याता, चौपड़ा उच्च माध्यमिक विद्यालय, बीकानेर ने हिन्दी भाषा की वैज्ञानिकता विषयक व्याख्यान में कहा कि हिन्दी भाषा अनगिनत विशेषताओं से युक्त आम आदमी के समझ वाली तथा उच्च व्याकरण एवं शब्दावली से युक्त है। कार्यक्रम के अध्यक्ष डॉ. समर कुमार घौरूई तथा वैज्ञानिक गणों में डॉ. राघवेन्द्र सिंह, डॉ. सज्जन सिंह एवं डॉ. शरत चन्द्र मेहता एवं प्रभारी राजभाषा डॉ. निर्मला सैनी ने अपने विचार रखे गए।

(4) कवि सम्मेलन (22.09.2012)

कवि सम्मेलन में बीकानेर के वरिष्ठ साहित्यकारों में श्री भवानी शंकर व्यास 'विनोद' द्वारा गंजापन एवं तोंद को नमस्कार, श्री गौरीशंकर जी मधुकर द्वारा निरक्षरता एवं मोबाइल, श्री विजय कुमार धमीजा, श्री संजय आचार्य 'वरूण' एवं श्री बुनियाद हुसैन 'जहीन' द्वारा कविताएं प्रस्तुत कीं। कार्यक्रम की अध्यक्षता केन्द्र निदेशक डॉ. नितीन वसन्तराव पाटिल ने की। इसमें भाकृअनुप अधीनस्थ बीकानेर स्थित संस्थान/केन्द्रों ने भी भाग लिया।

(5) पुरस्कार वितरण एवं समापन समारोह (25 सितम्बर, 2012)

हिन्दी पखवाड़ा, 2012 का पुरस्कार वितरण एवं समापन समारोह उत्साही एवं मनोरम वातावरण में मनाया गया। इस अवसर पर मुख्य अतिथि के रूप में प्रो. के.एम.एल. पाठक, माननीय उप–महानिदेशक (पशु विज्ञान), भाकृअनुप, नई दिल्ली को आमन्त्रित किया गया। इस अवसर पर प्रो. पाठक ने कहा कि हिन्दी में आपसी संवाद सुखद अनुभूति दिलाता है। इस भाषा की किसी भी भाषा में प्रतिस्पर्द्धा नहीं, यह सभी भाषाओं को साथ लेकर चलने वाली एक ऐसी भाषा है जो हमारे देश में सर्वत्र बोली जाती है। अतः आपके केन्द्र के हिन्दी पखवाड़े के कार्यक्रम के शुभ अवसर पर मैं सभी से यह आह्वान करता हूं कि समन्वित रूप से हिन्दी को अपनाएं इसे आगे बढ़ाएं। प्रो. पाठक ने वैज्ञानिकों से हिन्दी भाषा को अधिकाधिक रूप से अपनाए जाने की बात पर जोर देते हुए कहा कि यहां का उष्ट्र पालक, उष्ट्र–हितधारक, विद्यार्थी एवं आमजन हिन्दी

भाषा को अच्छी तरह से बोलता एवं समझता है, अतः अनुसंधानों के यथोचित लाभ हेतु आवश्यकता इस बात की हैं कि उनसे ज्यादा से ज्यादा आपसी संवाद, वैज्ञानिक एवं तकनीकी प्रचार–प्रसार सामग्री का प्रकाशन, हिन्दी भाषा के माध्यम से ही किया जाए।

इस अवसर पर केन्द्र के निदेशक एवं कार्यक्रम अध्यक्ष डॉ. एन.वी. पाटिल ने अतिथियों को बताया कि राजभाषा के प्रगामी प्रयोग हेतु केन्द्र द्वारा पूरे पखवाड़े में विभिन्न प्रतियोगिताओं का आयोजन कर कार्मिकों में राष्ट्रीय चिंतन को मुखारबिन्द करने हेतु उनकी अभिव्यक्ति कौशल एवं लेखन प्रतियोगिताओं के माध्यम परखा गया। पखवाड़े की सफलता इस की द्योतक है कि इसमें सामूहिक एवं सकारात्मक प्रयास, ऐसे कार्यक्रमों को वृहत् स्तर पर आयोजित करने की ओर हमें प्रोत्साहित कर रहे हैं। डॉ. पाटिल ने कहा कि हिन्दी पखवाड़े जैसे कार्यक्रम केन्द्र के हित में जुड़ने के महत्वपूर्ण अवसर हैं, इससे न केवल कार्मिकों के स्वयं अपितु केन्द्र की प्रगति का मार्ग भी प्रशस्त होता है। उन्होंने कहा कि आज केन्द्र के पास 40 से अधिक हिन्दी में लघु पुस्तिकाएं हैं, 'करभ' नाम से वार्षिक पत्रिका का नियमित रूप से प्रकाशन होता है, वार्षिक प्रतिवेदन पूर्णतया हिन्दी में भी प्रकाशित की गई है, केन्द्र को राजभाषा में सराहनीय कार्यों हेतु परिषद एवं नगर राजभाषा, बीकानेर द्वारा समय–समय पर पुरुस्कृत किया जा चुका है।

केन्द्र के इस शुभ अवसर पर विशिष्ट अतिथि के रूप में आमन्त्रित डॉ. एस.सी. गुप्ता, सहायक महानिदेशक, भाकृअनुप, डॉ. एस.एम.के. नकवी, निदेशक, केन्द्रीय भेड़ एवं ऊन अनुसंधान संस्थान, अविकानगर एवं डॉ. बी.के. बेनीवाल, अधिष्ठाता, राजुवास, बीकानेर द्वारा भी राजभाषा के उत्तरोत्तर विकास हेतु हिन्दी को अपनाए जाने के विचार प्रकट किए गए। साथ ही भाकृअनुप, नई दिल्ली के प्रधान वैज्ञानिक डॉ. विनीत भसीन, बीकानेर स्थित परिषद के संस्थान/केन्द्रों के कार्मिकों ने भी इस कार्यक्रम में शिरकत की।

मंचस्थ गण करभ पत्रिका का विमोचन करते हुए

राजभाषा कार्यशाला : 10 जुलाई 2012

राजभाषा नीति कार्यान्वयन के अन्तर्गत केन्द्र द्वारा **'अनुसंधान कार्यों हेतु फोटोग्राफी की तकनीकी जानकारियां'** विषयक आयोजित एक दिवसीय राजभाषा कार्यशाला में फोटो पत्रकार श्री दिनेश गुप्ता, केन्द्रीय शुष्क बागवानी संस्थान के आर्टिस्ट सह फोटोग्राफर श्री संजय पाटिल एवं नीकोन कम्पनी के प्रतिनिधि श्री गजेन्द्र को आमन्त्रित किया गया। सर्वप्रथम प्रभारी राजभाषा डॉ. निर्मला

सैनी ने कार्यशाला के उद्देश्य एवं महत्व पर प्रकाश डाला। फोटो जर्नलिस्ट श्री दिनेश गुप्ता ने छोटे व बड़े कैमरे से जुड़ी महत्वपूर्ण जानकारी देते हुए कहा कि कम्प्यूटर जगत में कैमरे के उपयोग सम्बन्धित तकनीकी बिन्दुओं को समझा जाए। उन्होंने वाईड लैंस ट्राई कोश शटल स्पीड प्राइस आदि के बारे में उपलब्ध सभी सुविधाओं, विशेषताओं संबंधी जानकारी/प्रशिक्षण प्रदान की गई। केन्द्र निदेशक डॉ. एन.वी. पाटिल ने कहा कि केन्द्र प्रकाशनों में उष्ट्र अनुसंधान संबंधी गतिविधियों एवं महत्वपूर्ण कार्यों को प्रदर्शित करने हेतु गुणवतापूर्ण छायाचित्रों की हमेशा आवश्यकता रहती है, कूपमण्डुकता को दूर कर विविध विषयों में ज्ञानार्जन करने से आपके व्यक्तित्व में भी निखार लाएगा।

छायाकार दिनेश गुप्ता कार्यशाला के दौरान

राजभाषा कार्यशाला : 30 मार्च, 2013

इस राजभाषा कार्यशाला में अतिथि वक्ता श्री ब्रजरतन जोशी, व्याख्याता (हिन्दी साहित्य), राजकीय डूँगर महाविद्यालय, बीकानेर द्वारा 'राजभाषा प्रबन्धन' एवं श्री बी.एल. भादानी, प्रोफेसर, अलीगढ़ मुस्लिम युनिवर्सिटी द्वारा 'उष्ट्र : ऐतिहासिक परिप्रेक्ष्य में' विषयक व्याख्यान प्रस्तुत किए गए। अतिथि वक्ता श्री ब्रजरतन जोशी ने कहा कि भाषा के प्रति विनयशीलता एक प्रेरणास्पद कार्य की श्रेणी में आता है। उन्होंने प्रबन्धन हेतु भाषा के प्रति समर्पण को पहला सूत्र बताया। तथा कहा कि हिन्दी एक वैश्विक भाषा होने के कारण संपूर्ण विश्व में इसके अध्ययन–अध्यापन की श्रेष्ठ व्यवस्था उपलब्ध है। श्री बी.एल. भादानी ने कहा कि 300–500 वर्षों में ऊँट पालन व्यवसाय में आए बदलाव तथा इसकी पालन पद्धति, ऐतिहासिक महत्व आदि को सामने लाया जाना चाहिए।

इस अवसर पर केन्द्र निदेशक एवं कार्यक्रम अध्यक्ष डॉ. एन.वी. पाटिल ने कहा कि जब कोई भी विद्वान व्यक्ति अपनी जीवन अनुभूत यात्रा/अनुभवों को व्याख्यान आदि के माध्यम से प्रस्तुत करता है तो यह उनके संपूर्ण जीवन का सार होता है। ये व्याख्यान हमें पुनः चेतनता प्रदान

अतिथि वक्ता श्री जोशी व्याख्यान देते हुए

करते हैं। उन्होंने कहा कि ऐतिहासिक व समकालीन परिस्थितियाँ, प्रमाणिकताओं से जुड़ाव स्थापित किया जाए ताकि ये उष्ट्र प्रजाति के संरक्षण एवं विकास में सहायक सिद्ध हो सके। उन्होंने भाषा रूपी अग्नि हमेशा प्रज्जवलित रखते हुए प्रचलित भाशा के प्रयोग की सलाह दी। सभी के प्रति धन्यवाद ज्ञापित कते हुए कार्यशाला का समापन किया गया।

केन्द्र को राजभाषा सम्मान

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र को नगर राजभाषा कार्यान्वयन समिति, बीकानेर के द्वारा वर्ष 2011–12 के दौरान नगर में राजभाषा के उत्कृष्ट प्रयोग के लिए नराकास, बीकानेर की दिनांक 26.06.2012 को आयोजित बैठक में प्रशस्ति पत्र प्रदान कर सम्मानित किया गया।

प्रभारी राजभाषा डॉ. निर्मला सैनी प्रशस्ति पत्र प्राप्त करते हुए

वर्ष के दौरान हिन्दी में निकाले गए प्रकाशनों की सूची

1. राजभाषा वार्षिक पत्रिका 'करभ' अंक नवम्
2. वार्षिक प्रतिवेदन (हिन्दी एवं अंग्रेजी अलग–अलग रूप में)
3. आत्मा परियोजना के तहत उष्ट्र पालन व्यवसाय प्रशिक्षण संबंधी पुस्तक
4. ऊँटनियों में थनैला रोग
5. परम्परागत चिकित्सा पद्धतियों द्वारा ऊँटों की बीमारियों का इलाज व वैज्ञानिक आधार।

ICAR WEST ZONAL SPORTS TOURNAMENT 2013