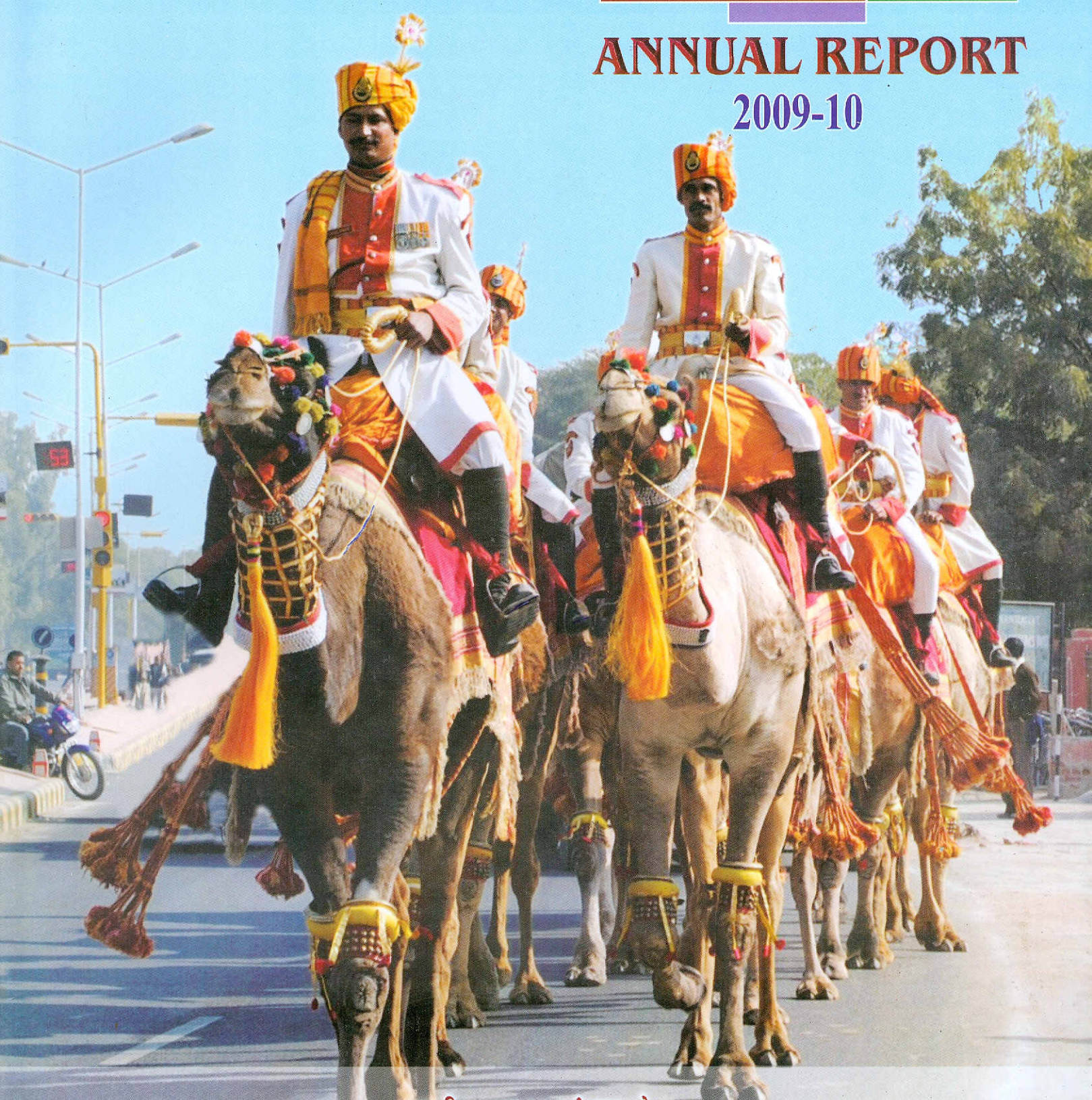
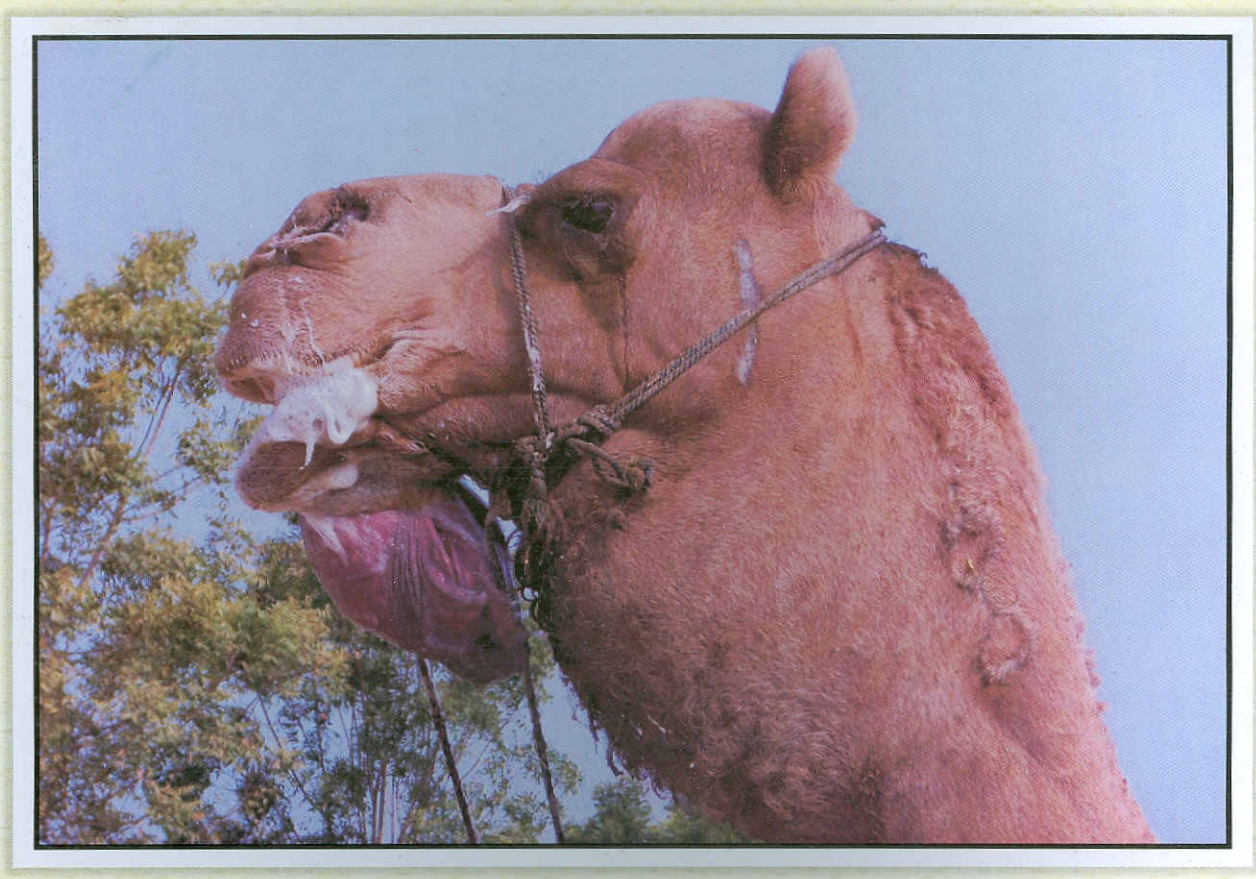
वार्षिक प्रतिवेदन 2009-10

ANNUAL REPORT 2009-10



राष्ट्रीय उष्ट्र अनुसंधान केन्द्र
(भारतीय कृषि अनुसंधान परिषद्)
जोड़बीड़, बीकानेर-334 001. राजस्थान, भारत

National Research Centre on Camel
(Indian Council of Agricultural Research)
Jorbeer, Bikaner-334 001. Rajasthan, India



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वार्षिक प्रतिवेदन
ANNUAL REPORT
2009-10

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

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र
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Preface

It gives me immense pleasure in presenting the progress and achievements of NRCC during the year 2009-10 in the form of Annual Report. The centre mandated to undertake both basic and applied researches following the roadmap decided in the Vision 2020 and 2025 documents and the recommendations of Research Advisory Committee has played significant role in showcasing the camel as an utility animal besides its traditional role for draught. This document comprehensively covers scientific and technological achievements in the areas of camel breeding and genetics,physiology,biochemistry, reproduction, nutrition, health, management, extension, farming and agro-forestry.

Some of the glimpses of research achievements under characterization of different breeds of camel included successful amplification of 23 microsatellite loci in the Mewari breed of which 10 were found polymorphic and the rest were monomorphic. There has been a better reproductive performance of the herd in the last 5 years having higher conception and calving rate along with a success in establishing pregnancy in a few camels as a result of artificial insemination using extended semen.The efforts to improve success rate with extended semen using double inseminations remain a future target. A survey in the breeding tract emphasized role of camel as draught animal providing livelihood and economic support to small and landless farmers. The centre has also been instrumental to highlight potential economic gains through camel rearing as a dairy animal and value addition of camel milk through preparations like *khoa*, milk powder and *burfi*.

The centre has been instrumental in offering reliable tool of gene specific PCR amplification for the diagnosis of Trypanosomosis and successful treatment schedule for common skin infections in the field areas. The efforts have also been made to establish partial gene sequence of the haemo-agglutinin gene of camelpox virus and full length gene sequence of the envelope gene of camel contagious ecthyma virus for which GenBank accession numbers have been assigned as a step forward towards vaccine development efforts. In the Camel Nutrition the practical issue of body weight loss in male camels during rutting seasons was addressed through the use of complete feed formulations and nutrient supplementation in addition to grazing.

I feel happy that the dedicated efforts of all the scientists could make it possible to bring the report in present form for which I express my sincere appreciation.The efforts made by the publication committee,In-charge PME Cell, technical and administrative staff are also thankfully acknowledged. The constructive analytical suggestions from the Research Advisory Committee under the chairmanship of Dr. Nagendra Sharma, Ex-Vice Chancellor, Sher-e-Kashmir University of Agriculture & Technology, Jammu has been of great help in fine tuning the research programmes and activities of the centre.

I am highly indebted to Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR for his support and encouragement for the development of this centre. I also express my sincere thanks to Dr. Mangala Rai Ex- Secretary, DARE and Director General, ICAR for his kind patronage to our pursuits. I express my sincere gratitude to Dr. K. M. L. Pathak, first in the capacity of Director of this centre for meticulous research planning and development and later as DDG (AS) for his constant encouragement and advice for all the activities of the Centre. I sincerely acknowledge the timely cooperation and help received from Dr. C. S. Prasad, ADG(AN&P), Dr. Lal Krishna, ADG(AH), Dr. T. J. Rasool, ADG(AP&B), Dr. Rajan Gupta, PS and Dr. Vineet bhasin, PS. I wish to thank Dr. R. K. Singh, Director, NRCE for his support and valuable leadership as Director of this centre during crucial period of the year.

I hope the information presented in this annual report will be useful for all the professionals and related institutions involved in camel research and development in the country.

(N.V.Patil)
Director

Prof. K. M. L. Pathak, DDG (AS) visits the Centre

विशिष्ट सारांश

केन्द्र के उष्ट्र समूह की जनन क्षमता बहुत अच्छी रही है। इस वर्ष गर्भधारण दर 92 प्रतिशत थी जो कि पिछले 5 वर्षों की अपेक्षा अधिक अच्छी पायी गई। उष्ट्र बछड़ों की पैदावार 80.65 प्रतिशत रही जो कि गत वर्ष की तुलना में अधिक थी। वर्ष के आरम्भ में उष्ट्र समूह की संख्या 310 थी जो वर्ष के अन्त तक 357 हो गई। केन्द्र में मेवाड़ी ऊँटों की संख्या बढ़ाने हेतु इस नस्ल के 11 अतिरिक्त ऊँटों की खरीद की गई। 22 कच्छी नस्ल के ऊँट भी क्रय किए गए। केन्द्र ने मार्च 1985 से मार्च 2010 तक 81 बीकानेरी, 8 जैसलमेरी एवं 1 कच्छी नर ऊँट, ग्रामीण क्षेत्रों में अनुवांशिक सुधार हेतु वितरित किए।

मेवाड़ी नस्ल के उपलब्ध असम्बन्धित ऊँटों के डीएनए नमूनें एवं प्रजनन क्षेत्र से 21 नमूने अध्ययन हेतु लिए गए। मेवाड़ी नस्ल में 23 माइक्रोसैटेलाइट लॉकाई सफलतापूर्वक प्रवर्धित किए गए। इन पशुओं के 10 नमूने बहुरूपिक थे तथा शेष एकल रूपी पाए गए। उष्ट्र समूह के सभी प्रजनन योग्य 39 पशुओं की जीवमिति का सितम्बर 2009 में आकलन किया गया। इसके आंकड़े विश्लेषित किए गए तथा जीवमिति के आधार पर ही नर ऊँटों हेतु रेखांकित मानकों द्वारा इनका चयन किया गया।

दुग्धकाल के माह तथा ब्यांत में परिवर्तन से प्रतिदिन औसत दुग्ध उत्पादन सार्थक रूप से भिन्न पाया गया। यह उत्पादन दुग्धकाल के दूसरे माह में सर्वाधिक पाया गया। पहले एवं तीसरे से सातवें माह तक यह उत्पादन लगभग तुलनात्मक था। तीसरे ब्यांत की अपेक्षा दूसरे ब्यांत में दुग्ध उत्पादन अधिक आंका गया। मादा ऊँटनियों तथा इनके बच्चों का दूध पीने की अवधि के दौरान का शारीरिक भार अभिलेखित किया गया। औसत मूल्यांकन, समूह निष्पादकता की अपेक्षा अच्छा रहा जो डेयरी पशुओं के बेहतर प्रबंधन का द्योतक है।

केन्द्र में कृत्रिम गर्भाधान के अन्तर्गत विस्तारित वीर्य द्वारा पहली बार दो ऊँटनियां गर्भित हुईं है। अगले वर्ष दोहरे गर्भाधान हेतु वीर्य विस्तारक को प्रयुक्त करते हुए और अच्छे परिणाम की अपेक्षा की जा सकती है।

केन्द्र के 10 ऊँटों द्वारा फार्म क्षेत्र की प्रायोगिक स्तर पर जुताई किए जाने हेतु बहुद्देशीय यंत्र संवाहक प्रयुक्त किया गया। विभिन्न जैव रासायनिक घटकों के लिए शरीर क्रिया संबंधी प्रभाव अभिलेखित किए गए एवं रूधिर सीरम नमूने विश्लेषित किए गए। शक्तिमापक की सहायता से खिंचाव बल मापा गया तथा ऊँटों द्वारा किए गए कार्य की गणना की गई। ऊँटों में कार्यिकी तनाव के बाद शरीर क्रिया संबंधी एवं जैव रासायनिक लक्षणों में आए परिवर्तनों का निर्धारण करने हेतु आंकड़े विश्लेषित किए गए। इसके अन्तर्गत कार्य के पश्चात शरीर क्रियात्मक प्रभावों जैसे मलाशयी तापमान, श्वसन एवं नाड़ी दर में महत्वपूर्ण परिवर्तन पाया गया। जैव रासायनिक लक्षणों का अध्ययन करने हेतु कृषि कार्यों के बाद रक्त सीरम विश्ले ाण किया गया। कार्य के पश्चात सीरम ग्लूकोज, लैक्टेट, कोलेस्ट्रॉल एवं एस्पार्टेट ट्रान्सऐमिनेस एंजाइम स्तर में महत्वपूर्ण परिवर्तन देखा गया। केन्द्र द्वारा ऊँटनी के दूध के मूल्य संवर्धन हेतु दुग्ध उत्पाद जैसे खोवा, दूध पाउडर एवं बर्फी तैयार किए गए। केन्द्र के मिल्क पार्लर पर इस वर्ष के दौरान उष्ट्र दूध एवं इससे बने उत्पादों की 2,51,541/– रूपये की बिक्री की गई तथा इनसे 1,18,105/– रुपये का शुद्ध लाभ अर्जित किया गया।

बीकानेर की 7 तहसीलों के 15 गांवों में 103 ऊँट पालकों से इसके उपयोग संबंधी विभिन्न पक्षों पर सर्वेक्षण किया गया। एक गाड़ी में प्रयुक्त ऊँट अपने जीवन के 16–18 वर्षों तक कार्य करता है जबकि गाड़ी की अवधि 6–10 वर्ष तक हो सकती है। एक गाड़ी 40–50 किलोमीटर की दूरी तय करते हुए 10–17 क्विंटल का भार प्रतिदिन ढो सकती है। ऊँट गाड़ी से प्राप्त औसत आय 400–500 रुपये प्रतिदिन तक पाई गई जो शहरी क्षेत्र में कुछ अधिक हो सकती है। एक नर ऊँट की कीमत 20,000–30,000 रुपये तथा ऊँटनी का मूल्य 15,000–25,000 तक पाया गया। एक नर ऊँट पूरे वर्ष में 230–250 दिन कार्य करता है तथा इसका प्रतिदिन कार्य समय 7–11 घंटे तक होता है।

ऊँटों में मुख्यतया 3 प्रकार के त्वचा संक्रमण, ऊँट

पालन से जुड़े क्षेत्रों में प्रायः देखे गए। इन्हें स्थानीय ऊँट पालक ठिकरिया, टाट की बीमारी एवं खराश के नाम से संबोधित करते हैं। ऊँटों की जीवाणु एवं फफूंद बीमारियों का जानपदिक रोग विज्ञान के लिए किए गए सर्वेक्षणों से इन ऊँटों में संक्रमणों की पुष्टि होती है। उचित वैज्ञानिक देखरेख के अन्तर्गत प्रभावित ऊँटों का औषधियों द्वारा उपचार किया गया।

ऊँटों में ट्रिपेनोसोमोसिस की बीमारी बीकानेर, हनुमानगढ़, जैसलमेर एवं उदयपुर में विशेषकर वर्षा ऋतु एवं इसके बाद बहुतायत में पाई गई। प्रयोगशाला परीक्षण के दौरान रक्त की जांच में गीला, पतला एवं गाढ़ा रूधिर लेप व जीन विशिष्ट पीसीआर प्रवर्धन विधि को अपनाते हुए पाया गया कि पीसीआर आधारित परीक्षण अधिक संवेदनशील होता है। झुंझुनूं जिले में कैमलपॉक्स के लक्षण प्रदर्शित करने वाले ऊँटों के रक्त एवं त्वचा खुरचन के नमूने लिए गए। कैमलपॉक्स विषाणु के रक्त अभिश्लेषण जीन की आंशिक जीन श्रृंखला एनसीबीआई डाटाबेस को भेजी गई जिसे जीन बैंक अभिगमन संख्या जीक्यू 453435 आंवटित की गई है। कैमलपॉक्स विषाणु का श्लाफेन जैसा प्रोटीन जीन प्रवर्धित किया गया जिसे पी जेम–टी रोगवाहक से क्लोन किया गया। उष्ट्र संवाहित एकथाइमा विषाणु की पूर्ण लंबाई युक्त जीन क्रम की आवरित जीन श्रंखला एनसीबीआई डाटाबेस में भेजी गई जिसे जीन बैंक अभिगमन संख्या जीक्यू 390365 आबंटित की गई।

नर ऊँटों में मदकाल के दौरान शारीरिक भार कम हो जाता है। इसीलिए बीकानेरी एवं जैसलमेरी नस्ल के 10–14 वर्ष तक की आयु के नर ऊँटों पर अध्ययन किया गया। इनके प्रथम समूह को बाजरा मिश्रित जबकि दूसरे समूह को गुड़ सहित मूंगफली तेल मिश्रित आहार खण्ड दिए गए। ऊँटों पर किए गए इस अध्ययन से स्पश्ट है कि इनके अच्छे आहार, शारीरिक भार में कमी की पूर्ति एवं पौष्टिक अन्तर्ग्रहण हेतु मूंगफली तेल एवं गुड़ मिश्रित आहार खण्ड दिया जाना चाहिए। परंतु इस प्रकार दिए गए आहार की लागत प्रथम समूह की तुलना में 71 प्रतिशत अधिक पाई गई। अतः मदकाल के दौरान ऊँटों के शारीरिक भार को स्थिर बनाए रखने के लिए एक उचित आहार योजना में सस्ता आहार संघटक मिश्रित आहार खण्ड वांछनीय है। ऊँट पालकों के स्थान पर भिन्न भिन्न आहार पद्धतियों के अन्तर्गत एक कूबड़ वाले ऊँटों की आहार क्षमता का मूल्यांकन किया गया। ऊँटों के बछड़ों की चराई एवं संपूरकता आहार के अन्तर्गत इनकी वृद्धि क्षमता का आकलन करने हेतु बीकानेर के गाढ़वाला गांव में 120 दिनों तक एक अनुसंधान किया गया। इस कार्य हेतु दो से अढाई वर्ष तक की आयु के 20 बीकानेरी उष्ट्र बछड़े चयनित किए गए। दस उष्ट्र बछड़ों को केवल चराई हेतु प्रातः 7 बजे से सायं 7 बजे तक भेजा गया जबकि अन्य दस बछड़ों को ऊँट पालक के घर पर ही जरूरत के अनुसार आहार दिया गया।

ऊँट पालक के घर पर रखे गए बछड़ों के भार में अभिवृद्धि अन्य बछड़ों की तुलना में सार्थक रूप से अधिक पाई गई। केवल चराई क्षेत्र में चरने हेतु भेजे गए बछड़े अधिक अन्तर्ग्रहण के बावजूद केवल अपना शारीरिक भार ही स्थिर रख पाए। इस अध्ययन से स्पश्ट है कि उष्ट्र बछड़ों की वृद्धि में केवल चराई से मिला आहार पर्याप्त नहीं है तथा इनकी अच्छी वृद्धि एवं स्वास्थ्य हेतु संपूरक आहार आवश्यक है।

फार्म प्रक्षेत्र की 25.25 हैक्टेयर भूमि पर मौसमी फसलें लगाई गई। ऊँटों को 20.25 हैक्टेयर चरागाह भूमि में चरने हेतु छोड़ा गया जबकि शेष क्षेत्र से 920. 6 क्विंटल हरे चारे की पैदावार हुई। सेवण एवं धामण जैसी बरसाती चारा फसलें 45 हैक्टेयर भूमि पर लगाई गई। सिंचाई द्वारा 10 हैक्टेयर क्षेत्र में ग्रामना चरागाह का विकास किया गया।

1. Executive Summary

The reproductive performance of the centre's camel herd has been fairly good with higher conception (92.21%) and calving rate (80.65%) than the performance observed in the last five years.During the year there was addition of 47 camels in the herd strength over the opening balance of 310.In order to strengthen the breed wise herd strength , 11 Mewari and 22 Kachchhi camels were purchased. Since inception of centre- during the period of March 1985 to March, 2010, the centre distributed 81 Bikaneri, 8 Jaisalmeri and 1 Kachchhi male for genetic improvement in the field. Available DNA samples of the unrelated Mewari camels and 21 samples collected from the breeding tract utilized for the study and 23 microsatellite loci were successfully amplified in the Mewari breed of which 10 samples were found polymorphic and the rest were monomorphic. Biometry of all the breed-able animals (39) of the herd was carried out in the month of September, 2009 and data was analyzed and selection of sires was done as per the laid down criteria on the basis of biometry. The average daily milk production varied significantly ($P<0.01$) with the month of lactation and parity of the animal. The month and parity interaction was also significant. The peak yield was obtained in the second month of lactation and production in 1st and 3rd to 7th month was almost comparable. Maximum production(ml/d) was observed in the 2nd parity (3332.88±37.47 ml) followed by 3rd parity (3149.63±38.22 ml). The body weight of calves of the she camels under milking was monitored along with their dams. The average values were better than the herd performance data indicating better management of dairy animals. Two camels became pregnant as a result of artificial insemination with extended semen at the centre. The results are expected to be better next year with double inseminations using extended semen.

The multipurpose tool carrier was used to plough the farm area by 10 experimental camels and physiological responses were recorded and blood serum was analyzed for various biochemical parameters .The draught was measured with the help of dynamometer and the work output of camels was calculated. The data was analyzed to assess the changes in the physiological and biochemical attributes after work stress. There was a significant change ($P<0.05$) in the physiological responses *viz.* Rectal temperature (degree centigrade), respiration and pulse rate after the work. The blood serum was analyzed to study the biochemical attributes after tilling work. The serum glucose, lactate, cholesterol, and aspartate transaminase activity changed significantly ($P<0.05$) after the work. The centre has taken a keen interest in the value addition of camel milk through *khoa*, milk powder and *burfi* preparation. Camel milk and its products were sold for Rs. 2,51,514/- during the year at camel milk parlour and a net profit of Rs. 1,18,105/- was realized. A survey was conducted on different aspects of camel use from 103 camel keepers of 15 villages located in 7 *Tehsils* of Bikaner. A carting camel works for 16-18 years during its life while the cart life varies from 6-10 years. A cart transports a weight of 10-17 quintals per day covering a distance of 40-50 km. An income of Rs 400-500 is realized per day from camel carting however this income is more in case of cities. The cost of male camel varies from Rs 20000 -30000 where as the cost of female camel varies from Rs 15000 - 25000. The working days of camel range from 230 – 250 days in a year and the daily working time is 7-11 hours.

There are mainly three skin infections in camels which are frequently observed in the field and termed as thikria, taat ki bimari and kharas by the local camel farmers. The survey work for the epidemiology of bacterial and fungal diseases of camels revealed the presence of these infections in camels. The camels were successfully treated with medicines through a suitable

scientific approach. Trypanosomosis was found to be the most prevalent disease of camels in Bikaner, Hanumangarh, Jaisalmer and Udaipur especially during rainy and post rainy seasons. During laboratory examination – adopting wet smear, thin smear and thick smear examination of blood and gene specific PCR amplification (VSG gene), it was found that the sensitivity was more in the later case. The blood samples and Skin scabs were collected from the camels exhibiting the symptoms of camel pox from Jhunjunu district in the month of November 2009. Partial gene sequence of the haemagglutinin gene of camel pox virus was submitted to the NCBI database for which the assigned Gene Bank accession number is GQ453435. Schlafen-like [protein gene of camel pox virus was amplified and cloned in p GEM-T vector. The full length gene sequence of the envelope gene of camel contagious ecthyma virus was also submitted to the NCBI database for which the assigned Gen Bank accession number is Gq390365.

In order to address the issue of body weight loss in male camels during rutting seasons a study was conducted on eight healthy male camels of Bikaneri and Jaisalmeri breeds aged 10-14 years and were offered feed blocks prepared containing either bajra in first group and jaggery plus groundnut oil in the second group. The study indicated better feed intake, less body weight loss and higher nutrient intake in camels given feed blocks containing groundnut oil and jaggery but feed cost of the second group was 71% higher than that of group first. There is need to develop suitable feeding strategy with feed blocks containing cheaper feed ingredients to maintain the body weights of the camels during rutting season. For Performance evaluation of dromedary camels under different feeding systems at farmer's door-step , an experiment of 120 days to assess the growth performance of camel calves under grazing and supplementary feeding was conducted in Gadwala village in Bikaner. Twenty Bikaneri camel calves of 2 to 2.5 year age were selected. Ten camel calves weighing 299.5±6.93 kg (GR group) were maintained at the owners feeding practice comprised of grazing alone from 7 a.m. to 7 p.m. while other group camels weighing 306.5±9.97 kg (SF group) were given ration as per requirements at owner's house.The average bodyweight of SF group was found (356.0±10.77) to be significantly higher than GR group (299.7±6.32). The GR group could just maintain the body weight despite of higher intake from grazing land. The SF group gained 62.50±3.59 Kg body weight with an average growth rate of 781 g/d. The study revealed that grazing alone could not support the growth of calves and supplementation is needed to achieve better growth and health.

Seasonal crops were sown in 25.25 ha of farm area. Camels were allowed to graze in 20.25 ha where as 920.6 quintals of green fodder was harvested from the remaining area. The rain fed crops namely Sewan (*Lasiurus sindicus*) and Dhaman (*Cenchrus setigerus*) were sown in 45 ha of land. The grammna (*Panicum antidotale*) Pasture was developed in 10 ha of land under the irrigation system.

2. Introduction

Brief History

On the recommendation of the National Commission of Agriculture (1976), the Government of India approved a Project Directorate on Camel under the auspices of ICAR during the last phase of VI Plan. The Project Directorate on camel started on 5th July, 1984 utilizing the physical facilities (149 camels of Bikaneri breed and around 824 ha land) of erstwhile camel breeding farm under the control of Sukhadia University, Udaipur. The physical facilities were transferred by Government of Rajasthan. Later on it was upgraded to National Research Centre on Camel (NRCC) on 20th September, 1995.

Location

The Centre is located in the Jorbeer area of Bikaner city. The soil type is mostly loose and sandy. The climate is mostly dry and hot with an average annual rainfall of around 250 mm. The temperature ranges between 30 to 46 °C in summer and between 4 to 28 °C in winter season.

Mandate

The Centre was started with the mandates of developing infrastructure and basic facilities for research on camel which were relevant for conservation and preservation of existing breeds of camel and generating baseline data. The existing modified mandates are,

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

The work of the Centre is being carried out by the camel breeding and genetics, physiology, biochemistry, reproduction, health, nutrition, management and extension, camel farming and agro-forestry units besides ARIS and PME cells.

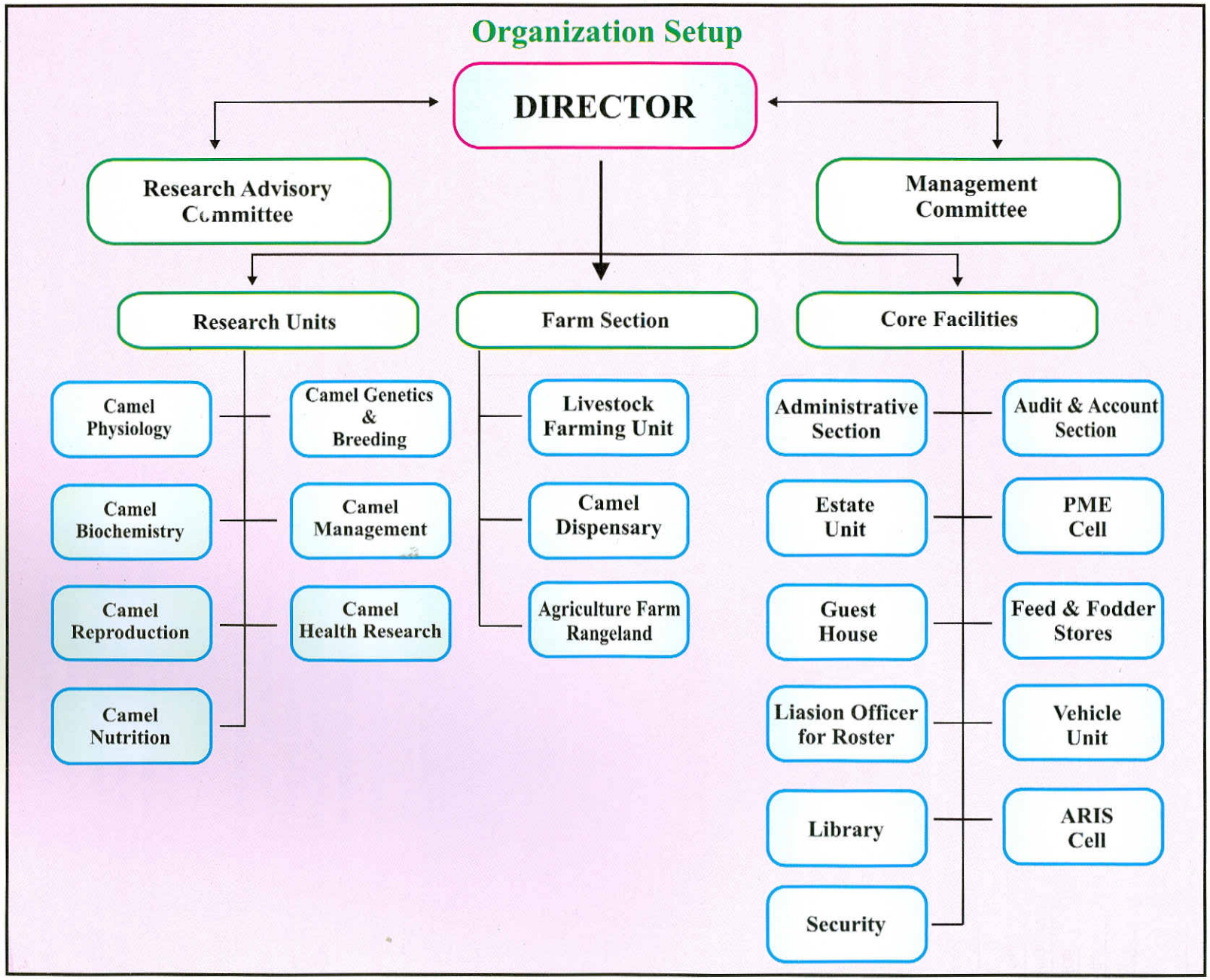
Infrastructure

Over the years, NRCC has developed excellent infrastructural facilities including modern laboratories and library.

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, health, nutrition, pathology and camel management.

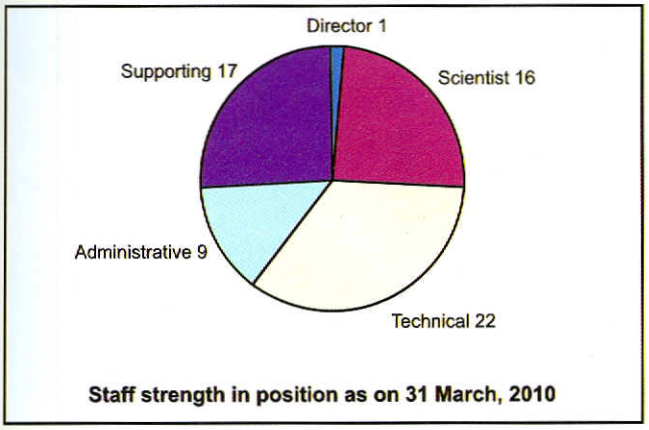
The Centre maintains an elite herd of about 350 camels comprising of Bikaneri, Jaisalmeri,Kachchhi breeds. An area of about 650 ha of farm land has been fenced and 45 ha of land have been brought under perennial silvipasture comprising of grasses, shrubs and trees. The library subscribes to about 21 Indian and 11 foreign journals and has collection of 6991 reference books.E-journals and doctoral dissertations are available on line through CeRA and Krishi Prabha projects of NAIP/ICAR.

The Centre is recognized as one of the important tourist place of Rajasthan. The camel museum at the Centre depicts historical, cultural, social, economical and scientific aspects of camel and attracts the attention of researchers and tourists. The camel milk parlour at the Centre serve different products *i.e.* flavoured milk, lassi, kulfee, tea and coffee to the tourists.


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

Staff position *(as on 31st March, 2010)*

Cadre	Number of posts sanctioned	Number of post filled
Director	1	1
Scientific	20	16
Technical	23	22
Administrative	10	9
Skilled Supporting Staff	19	17
Total	73	65



Staff strength in position as on 31 March, 2010

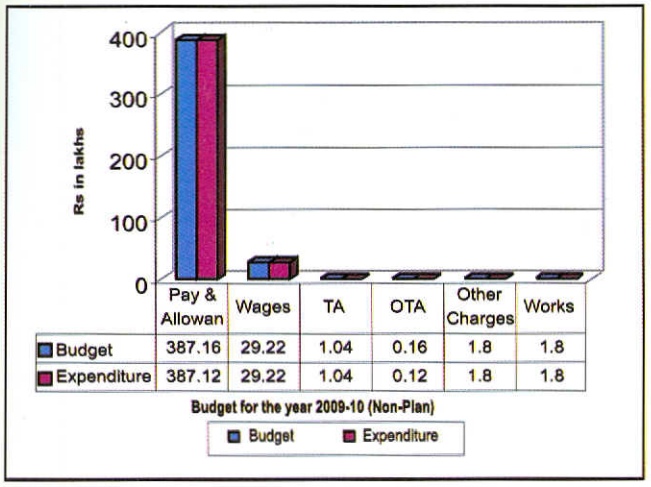
Financial statement (2009-10)

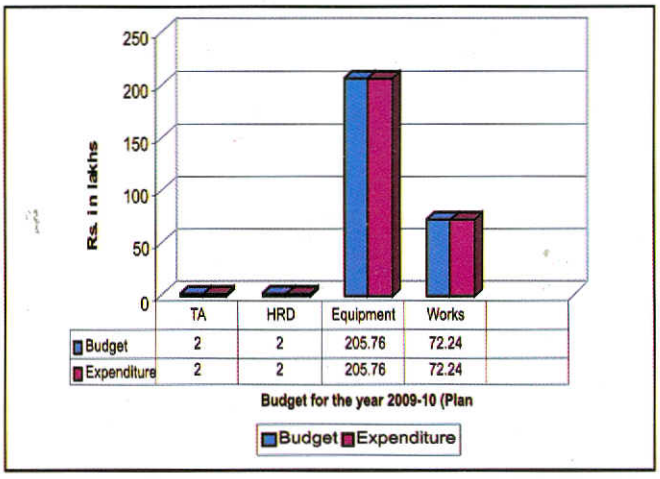
Through regular monitoring, the centre was able to ensure optimal utilization of funds available in the budget. The actual utilization of the budget both under plan and non- plan is furnished below:

Financial Statement and revenue receipt (2009-10)

(Rs.in Lakh)

Head of Account	PLAN		NON PLAN	
	Budget	Expenditure	Budget	Expen-diture
Pay & Allowances	-		387.16	387.12
Wages			29.22	29.22
T.A	2.00	2.00	2.25	0.89
O.T.A	-	-	0.16	0.12
H.R.D	2.00	2.00	-	-
Other charges including Equipment	205.76	205.76	5.40	5.39
Works	72.24	72.24	1.80	1.80
Total	**282.00**	**282.00**	**424.78**	**424.69**
Revenue receipt	**46.49**			





Dr. C. D. Mayee, Chairman (ASRB) visits the Centre

3. Research Achievements

The research targets set by the centre and discussed in the research advisory committee (RAC) were implemented in the respective projects.

Unit: Camel Genetics and Breeding

AGB-1.Studies on qualitative and quantitative genetic parameters in Indian Camel

Project Leader : S. C. Mehta

Associate : U. K. Bissa

Body weight and growth: The growth data was analyzed from the year 2005-10 for the Bikaneri, Jaisalmeri, Kachchhi, Arab cross and Mewari breeds of Indian dromedary. The effect of breed and sex was largely non-significant (P<0.05). The growth of camels in the current year was comparable with the performance in previous years at all the stages of growth studied (Table- 1 and 2).

Reproductive parameters: The reproductive performance of the centre's camel herd was good. This year the conception rate was 92.21% which is quite higher than the performance in last five years. The

Table-1. Growth performance of dromedary breeds (2005-2010)

(Body weight in kg)

Classes	Birth	3 Months	6 Months	9 Months	12 Months	15 Months	18 Months
Pooled	38.64±0.57 (235)	85.02±3.17 (193)	155.31±5.56 (149)	209.29±7.33 (145)	250.57±9.29 (140)	284.30±7.02 (113)	317.12±5.35 (84)
Breed	NS	*	*	NS	NS	NS	NS
Bikaneri	40.39±0.57 (82)	92.56±3.10 (70)	152.22±4.81 (58)	215.18±7.41 (53)	252.51±9.03 (52)	296.37±5.62 (50)	323.97±8.52 (29)
Jaisalmeri	38 .98.±0.57 (84)	97.75.±3.21(66)	168.06±5.34 (47)	219.00±6.75 (49)	256.40±8.44 (45)	282.15±6.84 385)	311.67±7.54 (34)
Kachchhi	38.82±0.75 (52)	88.89.±4.05(44)	166.90±6.01(35)	215.44±8.70 (33)	257.19±10.23 (34)	281.94±9.18 (22)	315.74±9.33 (21)
Arab	37.84±2.15 (6)	72.05±10.57(6)	143.73±18.57 (3)	179.61±21.40 (4)	225.75±27.20 (3)	276.78±23.97 (3)	-
Cross	37.19±1.64 (11)	73.84±10.02(7)	145.66±13.66(6)	217.23±18.27 (6)	260.99±20.57(6)	-	-
Mewari							
Sex	NS	NS	NS	NS	NS	NS	NS
Male	39.12±0.65 (140)	83.85±3.58 (116)	157.16±5.82 (94)	209.78±8.05 (87)	251.48±10.10 (83)	288.71±7.02 (67)	317.63±6.18 (53)
Female	38.16±0.69 (95)	86.39±3.80 (77)	153.47±6.51 (55)	208.80±8.20 (58)	249.66±10.09(57)	279.90±9.04 (46)	316.62±8.14 (31)
Year	*	**	**	**	**	**	**
Year 2005	36.56±1.01 (31)	66.95±5.37 (27)	121.88±7.20 (24)	168.12±24.56 (3)	204.17±32.96 (2)	234.03±10.09(18)	264.03±8.82 (22)
Year 2006	38.71.±0.89 (50)	79.05±4.76 (43)	150.47±6.43 (42)	184.34±8.35 (38)	218.68±9.47(39)	263.27±8.63 (37)	290.38±7.44 (32)
Year 2007	39.39.±0.94 (45)	71.61±5.09 (37)	138.47±7.07 (33)	208.97±8.91 (34)	250.90±10.62(30)	285.14±10.05(24)	353.80±15.00 (8)
Year 2008	40.22±1.05 (29)	79.58±5.51 (26)	179.46. ±16.05(4)	246.12±8.72 (26)	291.83±10.25(26)	338.61±10.47(22)	360.30±8.78 (22)
Year 2009	39.66±0.86 (52)	114.48±4.77(47)	186.29 ±6.10(46)	238.90±7.67 (42)	287.24±8.83 (43)	300.47±14.28(12)	-
Year 2010	37.30±1.07 (28)						

*P<0.05, **P<0.01, NS :Non-significant

Table-2. Growth performance of dromedary breeds (2005-2010)

(Body weight in kg)

Classes	21 Months	24 Months	27 Months	30 Months	33 Months	36 Months	48 Months
Pooled	333.90±9.79	367.12±11.17	357.48±7.26	395.39±8.63	410.87±7.41	443.81±11.53	455.03±21.25
	(105)	(99)	(85)	(49)	(77)	(70)	(43)
Breed	NS	NS	**	NS	NS	NS	NS
Bikaneri	338.09 ±6.03	365.29±6.85	404.11±7.84	405.50±16.62	406.05±15.45	432.57±23.93	471.18±19.68
	(38)	(38)	(30)	(17)	(28)	(26)	(18)
Jaisalmeri	341.32±5.75	372.04±6.75	399.03±7.88	408.69±16.62	414.77±15.12	434.67±23.59	438.69±21.62
Kachchhi	(42)	(40)	(33)	(17)	(28)	(27)	(16)
Arab-	339.65±7.71	375.37±9.61	401.11±10.36	384.38±17.75	412.75±16.73	465.55±26.54	468.22±22.57
	(24)	(20)	(19)	(11)	(3)	(14)	(8)
cross	316.56±37.60	355.79±42.87	255.67±27.43	382.98±31.80	409.91±33.29	442.45±51.02	441.32±56.77
	(1)	(1)	(3)	(4)	(4)	(4)	(1)
Sex	NS	*	NS	*	NS	*	*
Male	335.45±10.02	376.56±11.41	364.67±9.13	410.44±11.89	425.88±9.50	460.32±14.82	476.33±22.02
	(58)	(56)	(47)	(11)	(41)	(39)	(22)
Female	332.36±10.90	357.69±12.56	350.29±8.22	380.34±9.26	395.85±8.44	427.30±13.41	433.73±23.88
	(47)	(43)	(38)	(26)	(36)	(32)	(21)
Year	**	**	**	**	**	**	*
Year 2005	282.80±11.12 (22)	305.90±13.12 (18)	299.39±12.10(19)	374.35±12.69(17)	393.93±13.47(17)	417.85±21.11 (15)	490.41±17.02 (17)
Year 2006	314.20±11.50 (33)	358.87±13.32 (31)	346.51±10.28(32)	466.26±23.68 (4)	457.10±13.68 (30)	503.31±21.25 (28)	537.78±17.70 (23)
Year 2007	361.29±11.73 (28)	385.38±13.40 (28)	383.02±1159(22)	430.50±13.39 (25)	456.47±13.88(27)	484.21±21.90(25)	475.15±41.27 (2)
Year 2008	377.34±12.36 (22)	418.34±14.10 (22)	401.0±12.34(12)	310.45±40.52 (3)	335.97±42.16(3)	369.86±64.73(3)	316.78±57.08 (8)
Year 2009	-	-	-	-	-	-	-

*P<0.05, **P<0.01, NS :Non-significant

calving was 80.65% which also higher than the performance in preceding year (Table- 3 and Fig-1).

Mortality analysis: This year the mortality was very much in control. In all 3 Bikaneri, 4 Jaisalmeri and 2 Kachchhi camels succumbed to death during the period (Table-4 and Fig-2).

Field improvement: The opening balance of Centre's herd was 310 and the closing balance was 357 camels (Fig-3). In order to strengthen the Mewari herd at the Centre 11 more camels of the breed were purchased. In addition to this 22 Kachchhi camels were also purchased. From March 1985 to March, 2010 this Centre has distributed 81 Bikaneri, 8 Jaisalmeri and 1 Kachchhi male for genetic improvement in the field. (Table-5).

Databases:

1. **Inventory of the Centre's camel herd**. This includes pedigree information on all available animals of Bikaneri, Jaisalmeri, Kachchhi and Arab cross camels maintained at the Centre's farm.
2. **Database on biometry of Centre's herd**. This includes information on 17 traits (body measurements) of the camels maintained at the Centre.
3. **Reproduction database**. This includes information on reproductive performance of the Centre's herd from 1984 to 2010.
4. **Health database**. This includes information on mortality of animal at NRCC farm since 1984 to 2010.
5. **Production database**. This includes information on hair and milk production of camels of NRCC herd.

Table-3. Reproductive performance of the camel herd (2009-2010)

Year	Traits	Bikaneri			Jaisalmeri			Kachchhi			Mewari		Pooled Breeds
		Breeding	Repro	Post - partum	Breeding	Repro	Post - partum	Breeding	Repro	Post - partum	Breeding	Repro	Breeding
2009	Mating	10	13		15	8	-	10	5	-	13	-	48
	Conception	8	-	-	11	-	-	6	-	-	6	-	31(64.58%)
	Calving	6	3	4	11	2	1	4	2	-	4	1	25 (80.65%)
2010	Mating	27	5	-	12	11	-	12	7	-	26	1	77
	Conception	27	2	3	11	4	-	11	5	2	22	-	71(92.21%)

Table-4. Breed, sex, age and system wise mortality at NRCC (2008-09)

Breed	Sex		Age group			Pooled
	M	F	0-12 Months	1-3 Years	Above 3 Years	
Bikaneri	-	3	-	1	2	3
Jaisalmeri	1	3	2	-	2	4
Kachchhi	2	-	-	1	1	2
Mewari	-	-	-	-	-	-
Total Mortality	3	6	2	2	5	9

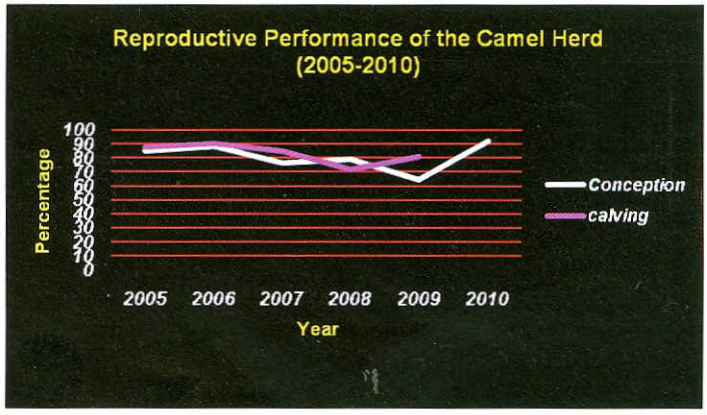


Fig. - 1 Reproductive Performance of the Camel Herd(2005-2010)

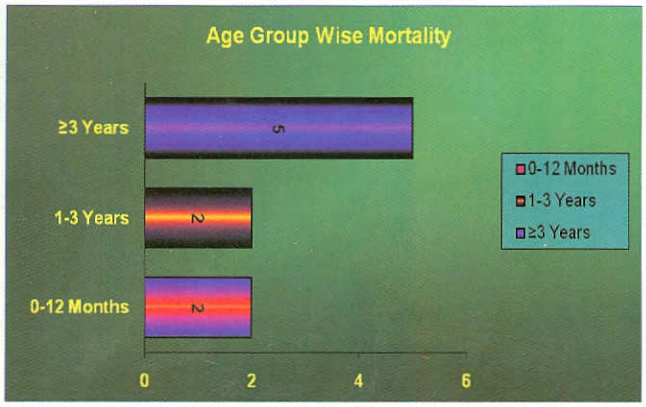


Fig. - 2 Age group wise mortality 2009-10

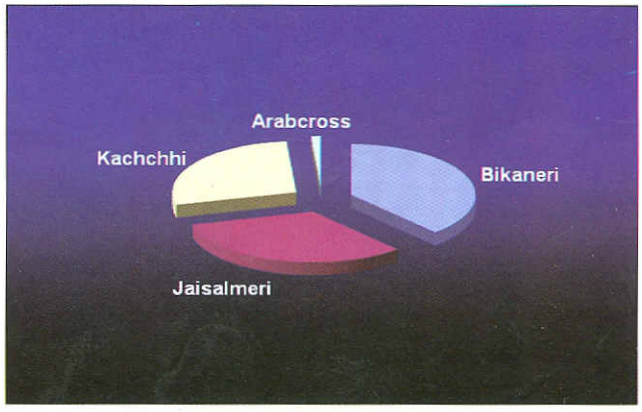


Fig. - 3 Herd strength (2009-10)

Table-5. Camel Herd Strength (2009-10)

Breed	Opening		Calving		Purchased		Died		Auction		Raj. Govt.		Closing	
Age	1-04-09												31.03.10	
Bikaner	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0-1 Yr	11	7	8	5									8	5
1-2 Yr	4	6						1					11	7
2-3 Yr	6	6							1	1			4	5
3-4 Yr	7	4									1		5	5
>4Yr	13	47						2					19	49
Total	41	70	8	5				3	1	1	1		47	71
Jaisalmeri														
0-1 Yr	8	4	10	4			1	1					9	3
1-2 Yr	7	4											8	4
2-3 Yr	8	4											7	4
3-4 Yr	5	4							1				8	4
>4Yr	14	38						2	4	2			14	38
Total	42	54	10	4			1	3	5	2			46	53
Kachchhi														
0-1 Yr	8	2	3	3									3	3
1-2 Yr	3	2				6							8	2
2-3 Yr	3	4			2	6	1						3	8
3-4 Yr	5	2			1				2				4	10
>4Yr	11	23			1	6	1			1			15	30
Total	30	33	3	3	4	18	2		2	1			33	53
Mewari														
0-1 Yr	3	3	1	4									1	4
1-2 Yr	0	0											3	3
2-3 Yr	0	1											-	-
3-4 Yr	1	0				1							-	1
>4Yr	3	23				10							4	34
Total	7	27	1	4		11							8	42
A*B														
0-1 Yr	0	0											-	-
1-2 Yr	0	3											-	-
2-3 Yr	0	0											-	3
3-4 Yr	0	0											-	-
>4Yr	1	2							1	1			-	1
Total	1	5							1	1			-	4
Grand Total	121	189	22	16	4	29	3	6	9	5	1	-	134	223

AGB- 4. Project : Selection for the improvement of draught ability of camel breeds

Project Leader : S. C. Mehta

Associates : A. K. Roy and U. K. Bissa

Selection of studs: Biometry of all breed-able animals (39) of the herd was carried out in the month of September, 2009. The data was analyzed and selection of sires was done as per the laid down criteria (Table-6 and Fig-4). Twelve animals out of 31 were selected for breeding the females of Bikaneri, Jaisalmeri and Kachchhi breed. The selected animals differed significantly in terms of their body length and heart girth. All available Mewari studs were selected for breeding looking into the requirement of the herd.

Earlier five half–sib families were identified and accordingly 23 animals were selected for evaluation of draught potential by the physiologist. Only 8 animals could be transferred to the physiologist for the purpose due to the engagement of the selected animals in other experiments. The data recorded by the physiologists were found insufficient for carrying out the genetic analysis.

Breeding plan: After selection of breeding males of the three breeds and allotting Mewari studs (Table-7), the pedigree of the breed-able females was studied and following suggestions were given for breeding Centre's camel herd :-

1. J210 and J112 may be used as teaser.
2. Bikaneri males 620, 622 and 624 may be used for breeding the females of village camel breeders.

Farm born stud should not be used on a female related to it either through sire or dam.

Table-6. Population mean and selection differential in adult camels

(in cm)

Breed	Selection	N	BodyLength	HeartGirth	Height At Wither
Over all	Selected	12	168.57±1.65	225.22±2.45	209.04±1.86
	Unselected	19	155.79±1.34	214.22±1.98	204.90±1.50
	Significance	31	**	**	NS
Bikaneri	Selected	5	174.80±2.51	223.40±3.71	204.20±2.82
	Unselected	5	157.40±2.51	217.20±3.71	208.20±2.82
Jaisalmeri	Selected	4	163.25±2.80	224.25±4.15	212.25±3.15
	Unselected	5	153.20±2.51	209.80±3.71	202.60±2.82
Kachchhi	Selected	3	167.67±3.24	228.00±4.79	210.60±3.64
	Unselected	9	156.78±1.87	215.67±2.77	203.89±2.10
Mewari#	Selected	3	150.67±5.46	206.67±6.14	199.67±4.07

*(P<0.05) ; **(P<0.01); NS –Non-significant

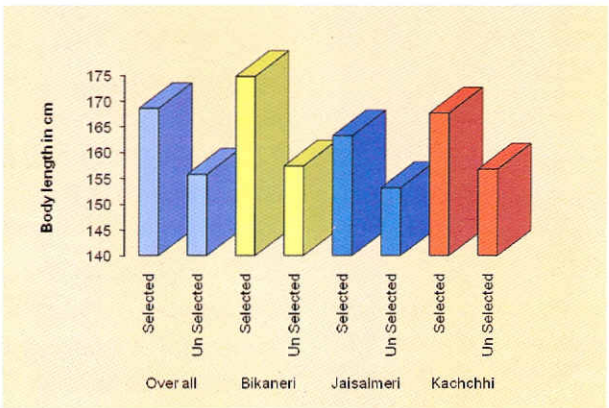


Fig-4. Body length in selected and unselected camels of the dromedary breeds

Table-7. Breeding plan for the year 2009-2010

Breed	Available females	Studs for breeding		Sire	Dam	Dams mated
		Number	Name			
Bikaneri	31	600	Suraja Ka Beta	418	255	9
		694	Sharmila	Purchased		
		592	Chhogali ka beta	526	443	
		692	Suraj	Purchased		13
		602	Chholki ka beta	366	463	7
Jaisalmeri	18	248	Ankorki ka beta	224	77	
		218	Pooniya	Purchased		11
		242	Mrigdan ka beta	40	42	
		228	Fatiya	Purchased		4
Kachchhi	15	136	Dhori ka beta	114	105	4
		126	Dugli ka beta	72	107	6
		166	Satya	Purchased		6
Mewari	5	6	Basant	Purchased		
		2	Pratap	Purchased		13
		4	Piliya	Purchased		14

AGB-7.Project:Genetic improvement of milk production potential of Indian dromedary

Project Leader : S. C. Mehta

Associate : U. K. Bissa

Selection of females (2010-11): Seven Bikaneri, 6 Kachchhi and 5 Mewari females were selected for the project. All of the females of Mewari breed and four of Kachchhi breed were purchased camels so they have been allotted tentative parity. The selection for the milking experiment was based on their lactation and availability for the project (Table-8).

Milk Production : Individuals and Breeds

Year 2008-09: Two teat milking was followed to allow proper let down of milk. Two teats (one front and one rear) were milked and the other two were left for the calf. The milking females were offered concentrate ration, Saras Gold (high energy ration) @ 3 kg / day. The recording commenced (approximately) from day 15th after calving. Three times milking has been followed till the calf attains an age of 3 months. The average daily milk production for first phase (first sixteen months) of lactation was 3606.31±64.59 ml with 3158.94±250.36 ml in Bikaneri and 4053.68±375.45 ml in Kachchhi. However the effect of breed was non-significant ($P>0.05$). The highest milk production was 5078.78±313.79 ml of K-117, which was in 3rd parity. The average daily milk production of the individuals varied significantly ($P<0.01$). Six animals continued giving milk beyond 16 months (second phase) and the average daily production in the second phase was 2108.64±93.49 ml with 1910.64±178.74 ml Bikaneri and 2306.64±361.19 ml in Kachchhi breed. One female (K-117) out of these six also stopped giving milk in 18th month of lactation. All five she camels (B-515, B-545, K-105, K-117 and K-103) which discontinued the lactation, were conceived and four of them calved in the next calving season (Table 9 & Fig. 5).

Out of 10 camels 9 continued till 16 months and the one (K-103) which discontinued giving milk in 14 month got conceived in the 12th month of lactation. Therefore the lactation in the camels was considered to be of 16 months duration. Accordingly the average

lactation yield was 3462 litres. The second phase of lactation i.e. 16 to 24 months was also evaluated and it was observed that only 3 camels continued giving milk in the 24th month of lactation and there was about 58% reduction in average daily milk yield, Hence it was decided not to milk the animals beyond 16 months.

Year 2009-10: The average daily milk production was 3177.19±41.93 ml with 3192.26±93.84 ml in Bikaneri, 3120.07±86.87 ml in Kachchhi and 3219.23±213.23 ml in Mewari breed (Table-10 and Fig-6). The Mewari camels produced higher milk but the effect of breed was non-significant (P>0.05). The highest milk production was 5007.46±175.05 ml of M-01. The average daily milk production of the individuals varied significantly (P<0.01).

Milk Production : Month & Parity

Year 2008-09: The average daily milk production varied significantly with the month of lactation. The peak yield was observed in the third month of lactation. Fourth and fifth month showed little decline from the peak yields followed by 2nd month. Maximum production was observed in the third parity (4847.09±40.24 ml) followed by 4th parity (3506.92±92.90 ml). The production in different months with respect to different lactations has been summarized in Table-11 and Fig-7.

Year 2009-10: The average daily milk production varied significantly (P<0.01) with the month of lactation and parity of the animal. The month and parity interaction was also significant. The peak yield was observed in the second month of lactation. The production in 1st and 3rd to 7th month was almost comparable. Maximum production was observed in the 2nd parity (3332.88±37.47 ml) followed by 3rd parity (3149.63±38.22 ml). The production in different months with respect to different lactations has been summarized in Table-12 and Fig-8.

Growth of calves and dams: The body weight of calves of the she camels under milking was monitored along with their dams. The average values are better than the herd performance data indicating better management of dairy animals (Table-13).

Table-8. Selection of female camels for milking (2010-11)

S.N.	Camel number	Parity	Status
	Bikaneri		
1	483	4	
2	515	3	
3	545	2	
4	569	2	
5	575	1	
6	579	1	
7	581	1	
	Kachchhi		
1	105	4*	Purchased
2	117	3*	Purchased
3	119	3*	Purchased
4	133	1	
5	139	1	
6	157	1*	Purchased
	Mewari		
1	19	1*	Purchased
2	21	1*	Purchased
3	27	1*	Purchased
4	35	1*	Purchased
5	81	1*	Purchased

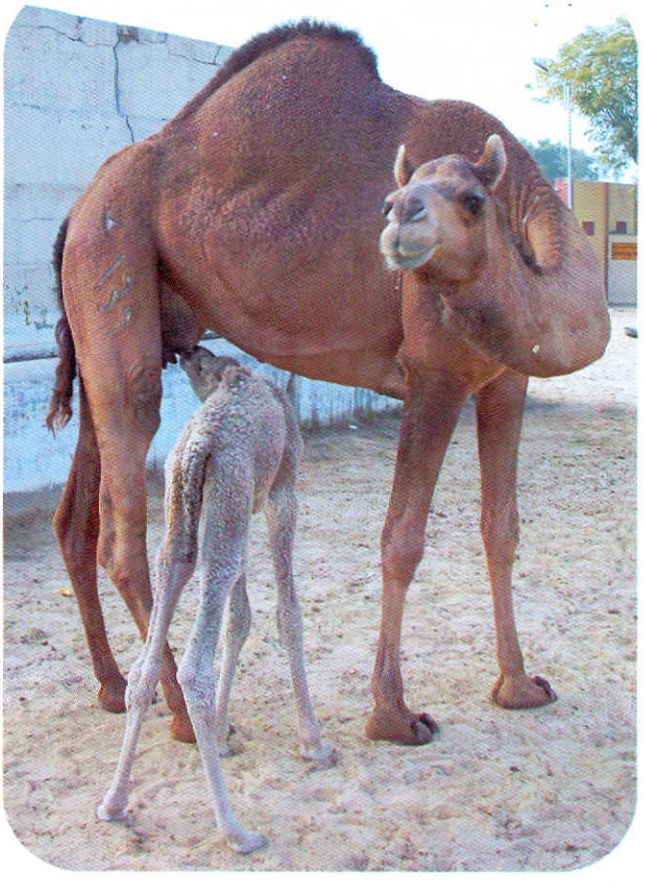


Table-9. Average daily milk production (2008-09) : Individuals and Breeds

(Two teat milking, milk yield in ml)

Animal Number	Morning		Evening		Total	
	Front	Rear	Front	Rear	Phase I	Phase II
Pooled	903.81±15.82(4661)	1113.31±18.40(4661)	615.56±14.36(4645)	776.11±16.76(4645)	3606.31±64.59(4703)	2108.64±93.49(1030)
Breed	NS	NS	NS	NS	NS	NS
Bikaneri	812.20±61.33(2858)	1002.09±71.29(2858)	549.28±55.63(2842)	667.77±64.96(2842)	3158.94±250.36(2877)	1910.64±178.74(798)
Kachchhi	995.42±91.97(1803)	1224.53±106.91(1803)	681.84±83.42(1803)	884.44±97.41(1803)	4053.68±375.45(1826)	2306.64±361.19(232)
D	**	**	**	**	**	**
K-83	1234.64±77.51(474)	1476.08±90.09(474)	965.39±70.30(472)	1141.73±82.09(472)	5017.81±316.37(479)	3358.48±272.07(182)
K-103	715.92±77.70(394)	922.59±90.32(394)	504.98±70.49(389)	591.00±82.31(389)	2961.11±317.18(395)	-
K-105	445.69±77.54(456)	600.82±90.14(456)	385.01±70.31(466)	472.31±82.11(466)	1939.04±316.41(473)	-
K-117	1378.36±76.86(480)	1614.27±89.35(480)	857.23±69.72(477)	1006.43±81.41(477)	5078.78±313.79(480)	1198.00±269.19(51)
B-515	884.67±77.50(477)	1093.15±90.09(477)	552.06±70.31(471)	741.69±82.10(471)	3530.35±316.36(479)	-
B-523	881.16±77.51(471)	1117.76±90.10(471)	542.92±70.31(470)	741.23±82.10(470)	3457.35±316.35(481)	1969.68±271.51(226)
B-537	798.48±77.50(479)	1000.89±90.08(479)	599.87±70.29(477)	780.96±82.08(477)	3396.10±316.37(479)	1889.71±273.70(217)
B-541	720.10±77.50(478)	940.34±90.08(478)	477.42±70.30(475)	658.25±82.09(475)	3007.52±316.36(480)	1883.34±273.70(116)
B-543	1081.90±77.18(476)	1294.87±89.72(476)	715.62±70.01(475)	887.86±81.75(475)	4215.44±315.07(480)	2352.62±271.40(238)
B-545	861.15±77.50(476)	1072.33±90.09(476)	555.08±70.30(473)	739.62±82.10(473)	3459.65±316.38(477)	-

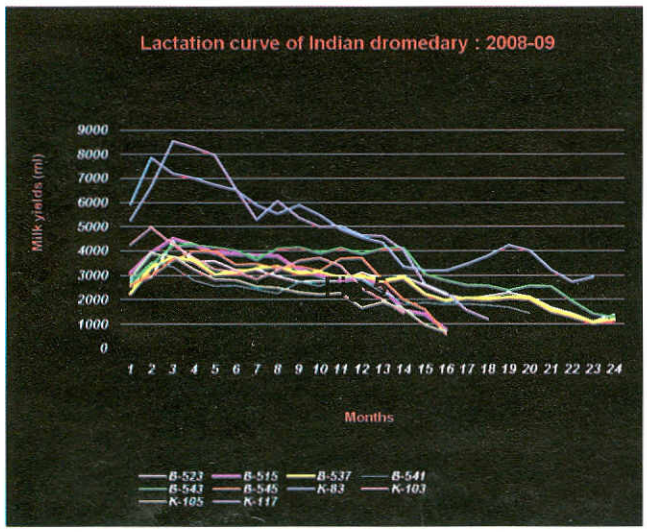


Fig-6 Lactation curve of Indian dromedary : 2008-09

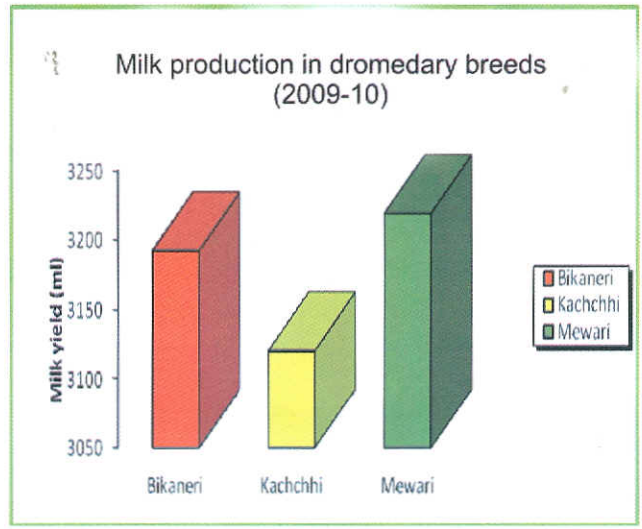


Fig-6 Milk production in dromedary breeds (2009-10)

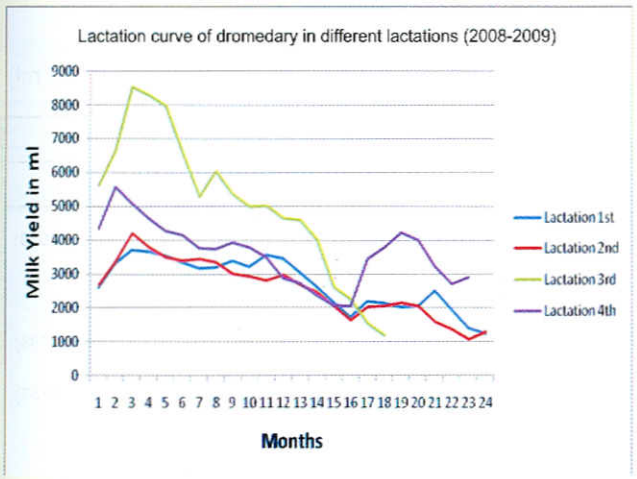


Fig-7 Lactation curve of dromedary in different lactations (2008-2009)

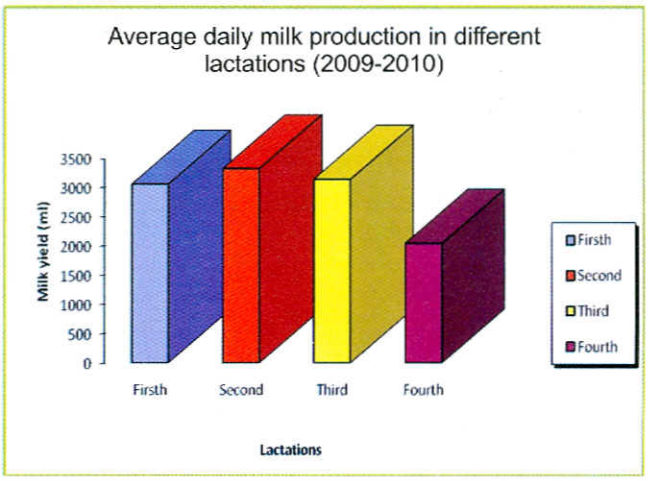


Fig-8 Average daily milk production in different lactations (2009-2010)

Table-10. Average daily milk production (2009-10) : Individuals and Breeds

Animal Number	Morning		Evening		Total
	Front	Rear	Front	Rear	
Pooled	850.54±14.08(5918)	984.08±14.56(5918)	542.70±10.58(5872)	678.01±11.28(5872)	3177.19±41.93(5939)
Breed	NS	NS	NS	NS	NS
Bikaneri	759.57±31.99(2319)	906.53±33.07(2319)	537.84±23.68(2301)	680.41±25.23(2301)	3192.26±93.84(2332)
Kachchhi	839.93±29.60(2559)	960.62±30.60(2559)	533.94±21.92(2542)	666.22±23.36(2542)	3120.07±86.87(2567)
Mewari	952.11±71.58(1040)	1085.07±74.00(1040)	556.32±53.80(1029)	687.40±57.33(1029)	3219.23±213.23(1040)
ID	**	**	**	**	**
M-01	1178.30±58.76(352)	1319.82±60.75(352)	922.76±44.17(348)	1081.84±47.07(348)	5007.46±175.05(352)
M-05	535.40±58.92(382)	669.81±60.92(382)	425.28±44.29(379)	554.83±47.20(379)	2458.99±175.52(382)
M-07	58.68±59.71(307)	135.48±61.73(307)	127.96±44.89(303)	197.21±47.84(303)	727.34±177.86(307)
K-109	1109.95±39.04(360)	1258.95±40.36(360)	684.93±29.16(358)	841.12±31.06(358)	4047.13±149.50(361)
K-123	1044.18±39.29(361)	1194.97±40.62(361)	661.08±29.33(359)	814.14±31.26(359)	3935.05±116.22(362)
K-125	868.19±39.43(380)	1016.78±40.77(380)	551.49±29.43(379)	690.11±31.37(379)	3266.33±116.58(384)
K-135	767.42±39.34(362)	911.38±40.67(362)	412.86±29.37(359)	551.80±31.30(359)	2826.27±116.36(362)
K-153	985.90±39.39(374)	1138.45±40.72(374)	601.19±29.14(371)	752.14±31.34(371)	3672.77±116.51(374)
K-155	895.42±39.49(370)	1043.33±40.82(370)	553.28±29.50(366)	693.72±31.43(366)	3284.49±116.82(370)
K-159	964.90±38.95(370)	1114.38±40.27(370)	577.30±29.09(367)	714.81±30.10(367)	3585.79±115.24(371)
B-455	544.72±44.07(242)	675.56±45.56(242)	335.33±32.86(239)	461.59±35.01(239)	1952.31±130.08(243)
B-473	924.52±43.09(394)	1050.25±44.55(394)	583.02±32.10(389)	719.23±34.21(389)	3213.39±127.15(396)
B-477	616.60±43.18(394)	756.73±44.64(394)	334.43±32.18(389)	449.27±34.28(389)	2050.75±127.42(395)
B-493	952.27±43.40(354)	1066.81±44.87(354)	634.20±32.23(358)	772.22±34.34(358)	3430.72±127.67(362)
B-497	978.06±37.26(124)	1099.32±48.86(124)	658.09±35.25(124)	795.99±37.56(124)	3801.73±139.56(125)
B-525	845.63±43.17(397)	954.87±44.63(397)	463.69±32.17(391)	591.46±34.27(391)	2757.22±127.39(397)
B-529	1188.96±42.97(395)	1322.40±44.42(395)	698.96±32.00(393)	844.66±34.10(393)	3994.46±126.80(396)

(Two teat milking, milk yield in ml)

Table-11. Average daily milk production in different months and lactations (2008-09)

Over all	Parity			
	1st	2nd	3rd	4th
	2722.33 ± 18.52	2574.68 ± 12.31	4847.09 ± 40.24	3506.92 ± 92.90
	(1789)	(1879)	(531)	(1529)
Month	**	**	**	**
1	2620.22 ± 75.59(90)	2686.19 ± 52.92(92)	5620.33 ± 109.89(30)	4338.00 ± 151.86(90)
2	3309.55 ± 75.59(90)	3361.43 ± 53.21(91)	6651.00 ± 109.89(30)	5558.33 ± 151.86(90)
3	3712.11 ± 75.59(90)	4186.00 ± 53.50(90)	8525.33 ± 109.89(30)	5066.89 ± 151.86(90)
4	3670.44 ± 75.59(90)	3785.62 ± 53.80(89)	8290.00 ± 109.89(30)	4637.22 ± 151.86(90)
5	3543.89 ± 75.59(90)	3498.33 ± 53.50(90)	7956.67 ± 109.89(30)	4261.11 ± 151.86(90)
6	3334.44 ± 75.59(90)	3382.22 ± 53.50(90)	6576.67 ± 109.89(30)	4152.22 ± 151.86(90)
7	3165.55 ± 75.59(90)	3433.33 ± 53.50(90)	5276.67 ± 109.89(30)	3750.00 ± 151.86(90)
8	3201.11 ± 75.59(90)	3350.00 ± 53.50(90)	6040.00 ± 109.89(30)	3722.22 ± 151.86(90)
9	3402.22 ± 75.59(90)	2991.11 ± 53.50(90)	5356.67 ± 109.89(30)	3918.89 ± 151.86(90)
10	3213.3 ± 75.59(90)	2935.55 ± 53.50(90)	4973.33 ± 109.89(30)	3788.89 ± 151.86(90)
11	3552.22 ± 75.59(90)	2793.33 ± 53.50(90)	5006.67 ± 109.89(30)	3495.55 ± 151.86(90)
12	3465.55 ± 75.59(90)	2965.55 ± 53.50(90)	4626.67 ± 109.89(30)	2884.44 ± 151.86(90)
13	3058.89 ± 75.59(90)	2677.78 ± 53.50(90)	4590.00 ± 109.89(30)	2742.69 ± 152.72(89)
14	2640.00 ± 75.59(90)	2458.89 ± 53.50(90)	4010.00 ± 109.89(30)	2358.46 ± 178.70(65)
15	2157.75 ± 76.01(89)	2048.86 ± 54.10(88)	2620.68 ± 111.77(29)	2080.32 ± 184.47(61)
16	1740.91 ± 76.44(88)	1642.07 ± 54.41(87)	2232.00 ±109.89(30)	2039.21 ± 201.74(51)
17	2205.00 ± 92.58(60)	2031.67 ± 65.52(60)	1546.42 ± 113.75(28)	3451.61 ± 258.76(31)
18	2155.00 ± 92.58(60)	2054.24 ± 66.08(59)	1195.65 ± 125.51(23)	3780.00 ± 263.04(30)
19	2026.67 ± 92.58(60)	2155.00 ± 65.52(60)	-	4217.24 ± 267.53(29)
20	2044.64 ± 95.83(56)	2047.45 ± 66.08(59)	-	4000.00 ± 258.76(31)
21	2516.67 ± 130.92(30)	1593.44 ± 64.98(61)	-	3216.00 ± 263.04(30)
22	1944.83 ± 133.16(29)	1365.57 ± 64.98(61)	-	2706.00 ± 263.04(30)
23	1406.67 ± 130.92(30)	1066.10 ± 66.08(59)	1000.00 ± 601.93(1)	2900.00 ± 1440.72(1)
24	1248.15 ± 138.01(27)	1282.61 ± 105.83(23)	-	1100.00 ± 1440.72(1)

Table-12. Average daily milk production in different months and lactations (2009-10)

(Two teat milking, milk yield in ml)

Over all	Lactations				
	1st	2nd	3rd	4th	Pooled
	3065.45±40.34(2518)	3332.88±37.47(1991)	3149.63±38.22(1035)	2048.31±58.97(395)	2899.07±22.32(5939)
Month	**	**	**	**	
1	2870.43±79.58(186)	3211.69±83.00(171)	3565.12±117.04(86)	2957.14±205.12(28)	3151.10±65.67(471)
2	3586.03±81.13(179)	3670.00±80.90(180)	3138.04±113.16(92)	2986.67±198.16(30)	3345.18±63.84(481)
3	3509.85±76.18(203)	3492.78±80.90(180)	2870.00±114.41(90)	2660.00±198.16(30)	3133.16±63.59(505)
4	3381.34±75.08(209)	3424.02±81.13(179)	3419.10±115.05(89)	2123.33±198.16(30)	3086.95±63.60(507)
5	3453.55±74.72(211)	3513.21±86.08(159)	3486.67±114.41(90)	2006.66±198.16(30)	3115.02±63.91(490)
6	3326.19±74.90(210)	3729.53±88.92(149)	3603.30±113.78(91)	1896.67±198.16(30)	3138.92±64.09(480)
7	3430.35±76.56(201)	3846.00±88.62(150)	3501.11±114.41(90)	1876.67±190.16(30)	3163.53±64.26(471)
8	3360.00±78.74(190)	3859.62±88.33(151)	3160.68±115.05(89)	1758.62±201.55(29)	3034.73±65.13(459)
9	3248.57±74.90(210)	3658.00±88.62(150)	3590.62±135.67(64)	1825.81±194.94(31)	3080.75±66.08(455)
10	2946.41±75.08(209)	3534.67±88.62(150)	3280.00±140.12(60)	1640.00±198.16(30)	2850.27±67.26(449)
11	2608.57±74.90(210)	3226.00±88.62(150)	2981.67±140.12(60)	1643.33±198.16(30)	2614.89±67.27(450)
12	2151.71±75.81(205)	2902.68±88.92(149)	2576.67±140.12(60)	1950.00±198.16(30)	2395.26±67.34(444)
13	1943.33±114.41(90)	2535.00±133.60(66)	2593.33±140.12(60)	1680.00±198.16(30)	2187.92±74.93(246)
14	3100.00±485.40(5)	2057.14±410.24(7)	2328.57±290.08(14)	1671.43±410.24(7)	2289.28±202.54(33)

Table- 13. Body weight of calves and their dams under milking (in kg)

Month	Calf	Dam
0	42.40	-
1	93.53	647.00
2	116.87	640.14
3	126.06	640.10
4	138.86	644.64
5	156.66	628.84
6	185.40	622.00
7	212.66	628.64
8	227.06	630.36
9	244.66	623.42
10	269.86	618.28
11	281.00	630.50
12	302.00	601.57

AGB -2. Project: Molecular genetic studies in Indian camel : Microsatellite markers for genetic characterisation of Bikaneri, Jaisalmeri and Kachchhi camel

Project Leader : S. C. Mehta

Available DNA samples of the unrelated Mewari camels plus 21 samples collected from the breeding tract were utilized for the study. Twenty three microsatellite loci were successfully amplified in the Mewari breed. Out of which 10 were polymorphic and rest were mono-morphic in the animals studied (Table-14 and Fig-9 & 10).

Table-14. Amplification of microsatellite loci in Mewari breed of camel

S. N.	Locus (5'-3')	Alleles(n)	Size (bp)	Temp (°C)	Status
1	LCA – 56	2	134-138	55	Polymorphic
2	LCA – 63	5	210-222	58	Polymorphic
3	LCA – 66	3	234-238	58	Polymorphic
4	CVRL – 03	5	182-215	58	Polymorphic
5	CVRL – 04	3	180-194	54	Polymorphic
6	CVRL – 05	4	155-174	59	Polymorphic
7	CVRL – 07	3	284-304	59	Polymorphic
8	LCA – 18	3	224-230	54	Polymorphic
9	LCA – 22	4	170-180	60	Polymorphic
10	LCA -33	3	122-130	60	Polymorphic
11	CVRL – 02	1	205	53	Monomorphic
12	CVRL – 06	1	196	60	Monomorphic
13	CVRL – 08	1	205	55	Monomorphic
14	LCA - 08	1	230	58	Monomorphic
15	LCA - 19	1	100	58	Monomorphic
16	LCA – 24	1	110	58	Monomorphic
17	LCA – 30	1	230	60	Monomorphic
18	LCA – 36	1	209	61	Monomorphic
19	LCA – 65	1	170	58	Monomorphic
20	LCA – 68	1	200	61	Monomorphic
21	LCA - 05	1	202	55	Monomorphic
22	LCA - 37	1	148	64	Monomorphic
23	LCA - 77	1	235	55	Monomorphic

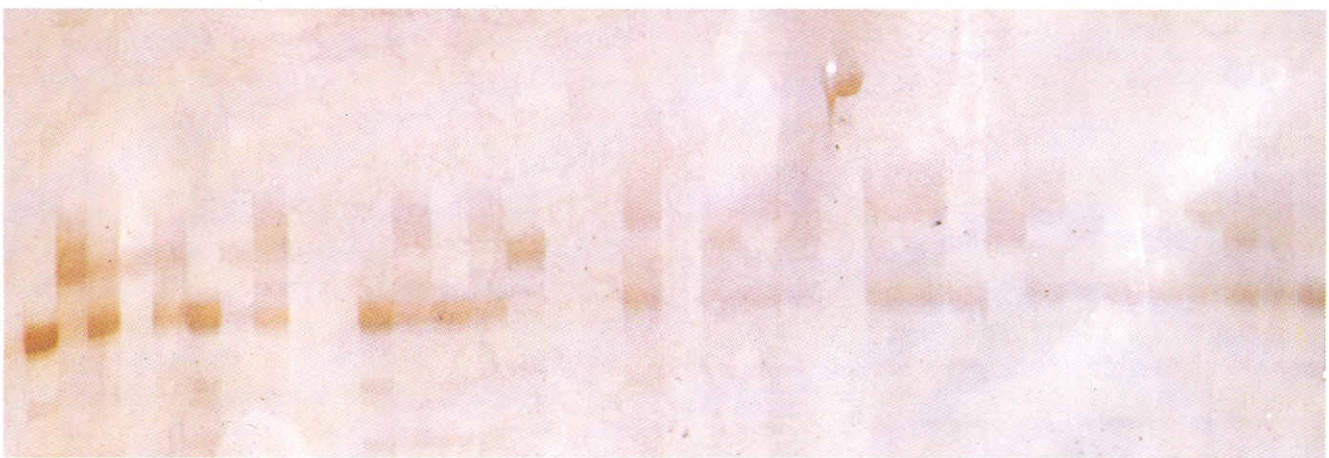


Fig-9. Microsatellite profile of Mewari camels at CVRL 04 loci.

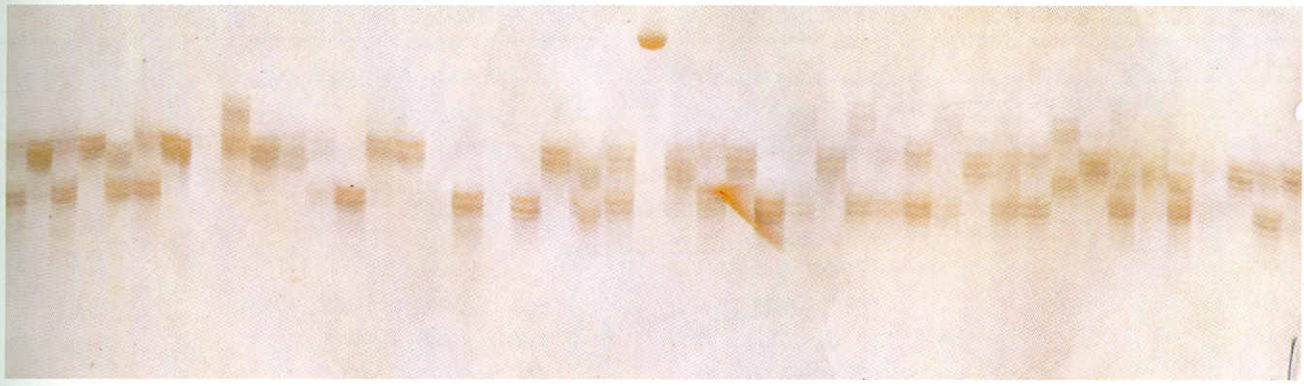


Fig-10. Microsatellite profile of Mewari camels at CVRL 05 loci.

Unit: Camel Physiology

AP-2.Project: Efficient utilization of camel energy during cart pulling and agricultural operations by camels (A Technical collaborative project with AICRP on increased utilization of animal energy with enhanced system efficiency, C.T.A.E. Udaipur)

Project Leader : A. K. Roy

Associates : A. K. Nagpal, C. Bhakat and G. S. Tiwari

A survey was conducted on different aspects of camel use from 103 camel keepers of 15 villages located in 7 *Tehsils* of Bikaner. A carting camel works for 16-18 years during its life while the cart life varies from 6-10 years. A cart transports a weight of 10-17 quintals per day covering a distance of 40-50 km. An income of Rs 400-Rs 500 is realized per day from camel carting however this income is more in case of cities. The cost of camel driven wooden cart with two wheels pneumatic tyres vary from Rs 14000 - Rs 16000. The cost of male camel varies from Rs 20000 - Rs 30000 where as the cost of female camel varies from Rs 15000 - Rs 25000. The working days of camel range from 230 – 250 and the daily working time is 7-11 hours.

The camels were used to rotate the rotary gear system to generate electricity and for chaffing grass. The multipurpose tool carrier was used to plough the farm area by 10 experimental camels (Fig. 11). The physiological responses were recorded and blood samples collected at the beginning and end of the work sessions. The blood serum was analyzed for various biochemical parameters. The draught was measured with the help of dynamometer and the work output of camels were calculated. The data was analyzed to assess the changes in the physiological and biochemical attributes after work stress.

The average area ploughed was 2200 m^2 per hour at an average draught power of 40 kg varying highly among animals. The endurance time varied between 60-90 minutes and the camels fatigued thereafter. There was a significant change ($P<0.05$) in the physiological responses *viz.* Rectal temperature (degree centigrade), respiration and pulse rate was 36.47 ± 0.148, 37.63±0.116; 15.6±0.306, 18.8±0.133; 45±0.333, 49±0.333 before and after the work respectively (Table-15.). The blood serum was collected to analyze the changes in the biochemical attributes after tilling work. The serum glucose, lactate, cholesterol, and aspartate transaminase activity changed significantly ($P<0.05$) after the work.

Fig- 11. Multipurpose tool carrier at work

Table-15. The physiological and biochemical attributes of camels before and after tilling work

S.N.	Attributes	Before Work ± S.E.	After Work ± S.E.
1.	Rectal Temperature	36.47±0.148	37.63±0.116*
2.	Pulse rate	45±0.333	49±0.333*
3.	Respiration rate	15.6±0.306	18.8±0.133*
4.	Glucose (mg/dl)	138.87±6.558	182.03±14.980*
5.	Cholesterol (mg/dl)	30.028±2.094	25.68±1.916*
6.	Triglycerides (mg/dl)	34.18±4.878	39.83±4.497
7.	Total Proteins (g/dl)	7.015±0.215	6.93±0.161
8.	Lactate (mg/dl)	10.93±1.024	81.66±15.296*
9.	Urea (mg/dl)	25.51±2.904	29.52±2.162
10.	Creatinine (mg/dl)	1.77±0.111	1.87±0.135
11.	Calcium (mg/dl)	9.13±0.266	9.36±0.368
12.	Phosphorus (mg/dl)	7.084±0.373	6.90±0.386
13.	Lactate Dehydrogenase (I.U./L)	699.1±68.99	739.9±82.69
14.	Aspartate Transaminase (I.U./L)	54.67±4.476	60.40±4.926*
15.	Alanine Transaminase (I.U./L)	10.02±0.655	9.49±0.583

*The means are significant (P<0.05)

AP-6.Project : Adaptation of camel to climate change in relation to temperature humidity index

Project Leader: Champak Bhakat

Associate : G. Nagarajan

For experimentation at farm, ten male camels, in 1 to 2 year age group were taken. All camels were kept under asbestos roofed shed at farm under similar feeding practices and management. All camels were reared under stall feeding conditions. Watering was done once in a day to all animals. Physiological parameters were recorded at certain time interval for all camels. To study the climatic variables, maximum thermometer, minimum thermometer, dry and wet bulb thermometer were installed at camel keeping place and recorded relevant climatic parameters daily in the morning and evening.

The rectal temperature (°C), pulse rate (beats per minute) and respiration rate (respiration per minute) of all experimental camels were recorded during different months and period from October'09 to March '10. The analysis of data revealed that average rectal temperature of camel during morning time varies between 36 to 36.7 where as during late evening it ranges from 38.3 to 39.6. It is minimum during morning and maximum during late afternoon and variation is significant ($P < 0.01$) for all camels and months from Oct'09 to Mar'10.

The average pulse rate (beats / minute) of camels were found to be higher during evening period which varies from 50 to 60.6. But it is lower during morning time with range from 39.5 to 50.3. This diurnal variation was significant ($P < 0.01$) for all camels and months.

The average respiration rate of camels was lowest during morning time which varies from 10.3 to 15.7 where as it is higher during the late afternoon. The average respiration rate ranged from 12.6 to 19.9. The morning and evening variation was significant ($P < 0.01$) for all camels and periods from Oct'09 to Mar'10.

Analysis of recorded data of climatic parameters during different period and months revealed that mean value of maximum temperature (°C) was higher during Oct'09 month (39.10). It dropped during Nov to Dec'09 to Jan'10 (20.43) and rose during Feb to Mar'10 (30.22). The average value of minimum temperature was lowest during Jan'10 (7.62) and highest during Nov '09 (23.8). Dry bulb temperature and wet bulb temperature were

recorded during morning and evening time and relative humidity was calculated on its basis. The relative humidity (%) varies greatly among the different months. It ranges from 37.39 to 57.39 during morning hours whereas during evening period it ranges from 6.64 to 17.70 from Oct'09 to Mar'10. The relative humidity was significantly ($P < 0.01$) higher during morning as compared to evening period for all months.

Table-16 reveals the average value of temperature humidity index (THI) during months & periods. The great variation was found for THI value during different weeks in different months. The THI was significantly ($P < 0.01$) lower during morning as compared to evening hours. The morning and evening variation was significant ($P < 0.01$) for all weeks in different months from Oct'09 to Mar'10 (Fig- 12). The morning THI varies from 60.3 to 79.3 whereas evening THI varies from 66.9 to 87.4 during these months.

The Benezara coefficient of adaptability (BCA) of camel is found out for all camels for different months and periods. The analysis of coefficient value reveals that BCA was significantly ($P < 0.01$) higher during evening time as compared to morning time.

Table-16. Average value of Temperature Humidity Index during months & periods

		Oct'09				Nov'09				Dec'09			
Weeks		1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
THI1	**	77.9	79.3	78.1	71.4	73.4	73.4	72.0	72.3	65.5	64.4	64.4	63.6
THI2		84.0	87.4	84.1	78.2	78.7	78.6	79.1	79.2	70.5	69.7	69.9	69.5
		Jan'10				Feb'10				Mar'10			
Weeks	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	
THI1	**	60.3	60.3	61.0	61.7	63.1	62.0	61.5	61.3	63.8	64.4	64.4	65.2
THI2		67.7	67.8	66.9	67.4	70.0	70.0	69.5	66.9	69.6	69.9	69.7	70.3

** Significant at 1 %; THI1- Morning, THI2 – Evening.

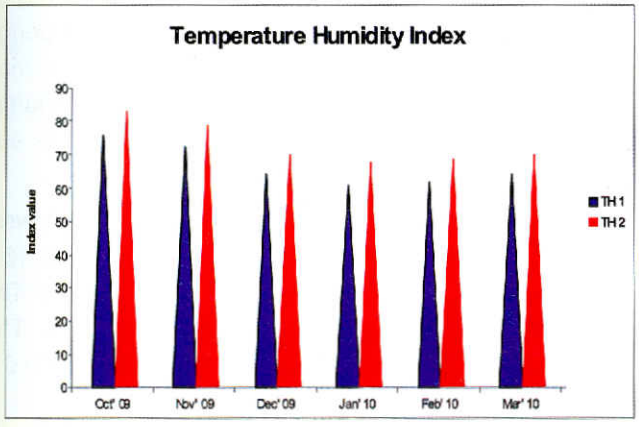


Fig-12. Temperature humidity index

Unit: Camel Reproduction

AR-5. Project : Improving the efficiency of artificial insemination in camel using existing and emerging technologies.

Sub-project : To study the time of insemination in camel with use of hCG preparations

Project Leader : Sumant Vyas

Associates : Gorakh Mal

Blood progesterone assay: The blood samples (sera) were collected during the last year (2008-09) from the camels inseminated after administration of Chorulon (hCG) 4500 I.U. and preserved at -20°C. The progesterone assay was performed. EIAgen progesterone kit that employs direct solid phase enzyme immunoassay for the quantitative measurement of progesterone in human serum or plasma (Adaltis Italia S.p.a. via Cristoni, 1240033 Casalecchio di Reno, Bologna, Italy) was used for assay of progesterone in camel serum. The values are depicted in Table 17. It was revealed that ovulation was induced in 16 and failed to induce in 17 cases. Therefore it was concluded that a new hormonal preparation other than Chorulon should be tried for the induction of ovulation before AI in the dromedary female camel.

Artificial insemination: The Livestock farm section allotted five female camels in time. They were examined

per rectum as per schedule for ovarian status before giving hormonal treatment for ovulation. In all 22 rectal examinations were performed. The ovulating agent was changed this year. Highly purified Human Chorionic gonadotrophin HPHCG) preparation, Inj. Pubergen HP (Manufactured in India by UNI-SANKYO Ltd was used and its dose 5000 I.U. was constant. It was administered i.m. when at least one follicle with diameter of 1.0- 2.0 cm size was available on either of the ovary.

The male camels were selected and semen was collected not more than twice a week per male camel. The semen was collected using artificial vagina. And quality was assessed for volume, white colored, volume, thick gel, high sperm concentration (qualitative analysis under microscope). The semen was extended immediately after collection using freshly prepared Tris egg yolk citrate extender within 10 m of collection. The insemination technique (AI gun and sheath of bovine) and site of deposition (uterine body) was same as practiced last year. The insemination was done at 27-28 h of the injection of Pubergen HP. Single insemination was attempted every time. The blood was collected at 0, 7, 9, 15 and 30 days of hCG administration for progesterone assay. The pregnancy was checked by tail cocking method at 21 days and was further confirmed by rectal palpation at 45-60 days of insemination.

Two (B565, K121) camels are confirmed as pregnant. This is the first report of pregnancy from artificial insemination done with extended semen in Indian dromedary (Table-18). The experiment will be repeated next year with double insemination every time at the interval of 12 or 24h.

Table-17. Serum Progesterone concentration (ng/ml) at different days after Chorulon (4500 IU) administration in dromedary female during breeding season

S.N.	Camel number		Serum Progesterone concentration. (ng/ml) at days after Chorulon (4500I.U.)					Ovulated (O) or non-ovulated (NO)
			0	7	9	15	30	
1.	C-27	I	0	2.0	6.4	0	0	O
2.		II	0	0	0	0	0	NO
3.	B 495	I	0	1.45	0	0	0	O
4.		II	0	0	0	0	0	NO
5.		III	0	0	0	0	0	NO
6.	C 372	I	0.54	0	0.1	0	0	NO
7.		II	0	0	0	0	0	NO
8.	J 83	I	0.3	0	1.1	-	1.4	O *
9.		II	0	0	0	0	0	NO
10.	B 537	I	0	0.27	0.6	0	0	NO
11.		II	0	3.5	5.0	0	0	O
12.		III	0.1	0.2	0.6	0	0	NO
13.	J 89	I	0.6	0.2	0.4	0.8	0.2	NO
14.		II	0.2	0.44	0.24	ND	ND	NO
15.		III	0.46	0.95	ND	ND	0.2	O
16.		IV	0.2	0.2	ND	ND	ND	NO
17.	B 541	I	ND	0.2	0.2	6.4	ND	O*
18.		II	ND	0.97	0.85	3.36	0.2	O*
19.		III	ND	0.97	1.0	ND	ND	O
20.	J 93	I	0.54	5.4	1.4	0.21	ND	O
21.		II	ND	2.0	2.5	ND	0.2	O
22.	B 503	I	0.3	0.6	0.2	0.38	0.4	NO
23		II	0.4	0.3	0.24	0.52	0.3	NO
24	J 117	I	0.27	0.24	0.18	4.6	ND	O*
25.		II	ND	ND	0.16	0.25	ND	NO
26	B 567	I	ND	ND	0.24	0.1	0.1	NO
27.		II	ND	ND	0.16	0.25	ND	NO
28.	K 121	I	ND	0.6	ND	ND	ND	NO
29.		II	0.11	7.0	11.0	0.1	0.2	O
30.	K 141	I	0.2	3.4	4.2	0.2	0.1	O
31.		II	0.1	3.6	8.0	0.36	ND	O
32.	K 83	I	ND	4.1	6.1	ND	0.1	O
33		II	0.1	2.2	3.8	ND	ND	O

Ovulated 16 Non-Ovulated 17 *- Conceived but early embryonic death

Table-18. The result of artificial insemination (single insemination) at 26-27 h after Pubergen-HP 5000IU

S.N.	Camel number	Date of AI	Semen from stud	Pregnant or non-pregnant
1	B 565	20/1/10	B 600	P
2.	B 525	22/1/10	B 602	NP
3.		24/2/10	B 600	NP
4		23/4/10	B 622	NP
5	J 109	2/2/10	J 228	NP
6		4/3/10	J 228	NP
7		13/4/10	J 242	NP
8	J 139	15/2/10	J 228	NP
9		30/4/10	J 244	NP
10	J 93	11/2/10	J 218	NP
11		15/3/10	J 228	NP
12	K 121	3/2/10	K 142	P

AR-6. Project : Role of sexual and bio-stimulation in camel reproduction

Sub-Project :To study the effect of poll gland secretion as sexual and bio-stimulant in camel reproduction.

Sub-project Leader : Sumant Vyas

Associates : Gorakh Mal and U. K. Bissa

Collection anad evaluation of poll gland secretion: Collection of poll gland secretion from adult male camels in natural, unhampered conditions was attempted. It was revealed that there is individual variation in amount of secretion. The color was uniformly dark brown to black and a peculiar odor was common to all secretions. The poll gland secretion was ample during breeding season when the male camels are in rut. But the secretion was very scanty during the non-breeding season. The color was somewhat light during the non-breeding season. The smell was also present during the non-breeding season. The samples were preserved at –20 °C.

Effect of Biostimulation on augmentation of rut in male camel: It was planned to repeat the experiment conducted last year (2008-09) which was a success. But during the reporting period in the month of October and November, 2009, majority of breeding males were employed in the experiments of the "Camel pox vaccine project" and 'nutrition trial for oat meal". Only five studs (B 622, 692, k 142, J 218 and J 244) could be subjected to biostimulatory measure. In the biostimulatory measure, the males were tied near the corral in early morning 6-8 AM where adult non-lactating non-pregnant female camels are kept and /or brought inside the corral for 15 minutes each on alternate days. The camels showed only partial symptoms of rut. However they were allowed rather coaxed to copulate with the females (possessing follicle ≥ 1.0 cm). Four females got pregnant. It can be safely concluded that Biostimulation or sexual stimulation has a positive effect on male reproduction and can be effectively used to augment rut in the month of October. It is also recommended that breeding camels should not be used for any experiment other than breeding/reproduction after September.

Behaviour experiment with poll gland secretion: 12 adult non-pregnant females were divided in three groups

A, B, C of four each. Each group was tested with poll gland secretion collected in breeding season (PGS-BS), poll gland secretion collected during non-breeding season (PGS-NBS) and water (W). One heifer was used as test animal- the test material was poured over the poll gland region of the test animal and then it was introduced to the group of four females. It was kept with the group for 30 minutes. The four test females were observed for the olfactory, contact, flehmen and evoked behaviors. The females in three groups were changed randomly in the second trial and third trial.

The results are shown in Table 19. Summarily it can be safely concluded that the PGS-BS evoked greater olfactory, contact and flehmen response than PGS-NBS and water.

Chemical analysis for presence of pheromone in poll-gland secretion: The poll gland secretion collected during breeding season (n=6; A1 to A6) and during non-breeding season (n=6; B1 to B6) were transferred to IPFT, an institute under Ministry of Chemicals and Fertilizers, Gurgaon for GCMS analysis. The aliquots of equal amount from A1 to A6 and B1 to B6 were mixed to avoid individual variation. Finally the two samples were termed as sample A (Breeding season) and Sample B (non-breeding season). Non-Polar and medium polar solvents were used for extraction to extract all organic compounds. Samples were analyzed using GC-MS, model Agilent 7890A GC and 5975C inert XL EI/CI MSD with triple axis detector, equipped with DB-5MS column (30 m × 0.25 mm × 0.25 µ). GC-MS data file were subjected to library search using NIST 2005 and wiley 08 version. **Cholestanol or cholestan-3-ol,** a derivative of cholesterol was present in both samples. Dichloromethane extract of sample A (breeding season) was different from sample B (non-breeding season) only in respect of presence of two steroids in the former. Sample A contains two extra peaks at RT 22.580 min and 22.839 min, which were absent in sample B (Fig. 13). Rest other compounds present in both the samples (A & B) were exactly matching with each other. The peak at RT 22.580 min is appeared to be **Androst-16-en-3-ol**, (3.alpha.,5.alpha). The peak at RT 22.839 min is appeared to be **Androst-16-en-3-one**, (5.alpha.). **Androstenol** has pheromone-like properties in both animals and humans and **Androstenone** was the first mammalian pheromone to be identified. This is the first report of Pheromone identification in Camel.

Table-19. The result of behaviour experiment with poll gland secretion collected in breeding and non-breeding season

S.N.	Behavioural response of camels	PGS-BS	PGS-NBS	Water
1	Sniffing camel with test fluid	7	9	5
2	Sniffing poll gland region of camel with test fluid	51	28	4
3	Sniffing vulva region with test fluid	5	10	0
4	Contact with camel with test fluid	30	19	16
5	Licking camel with test fluid	3	0	0
6	Flehmen*	9	1	0
7	Jumping over camel with test fluid*	12	4	0
8	Biting the camel with test fluid	99	54	23

* The values are statistically different significantly at 1%.

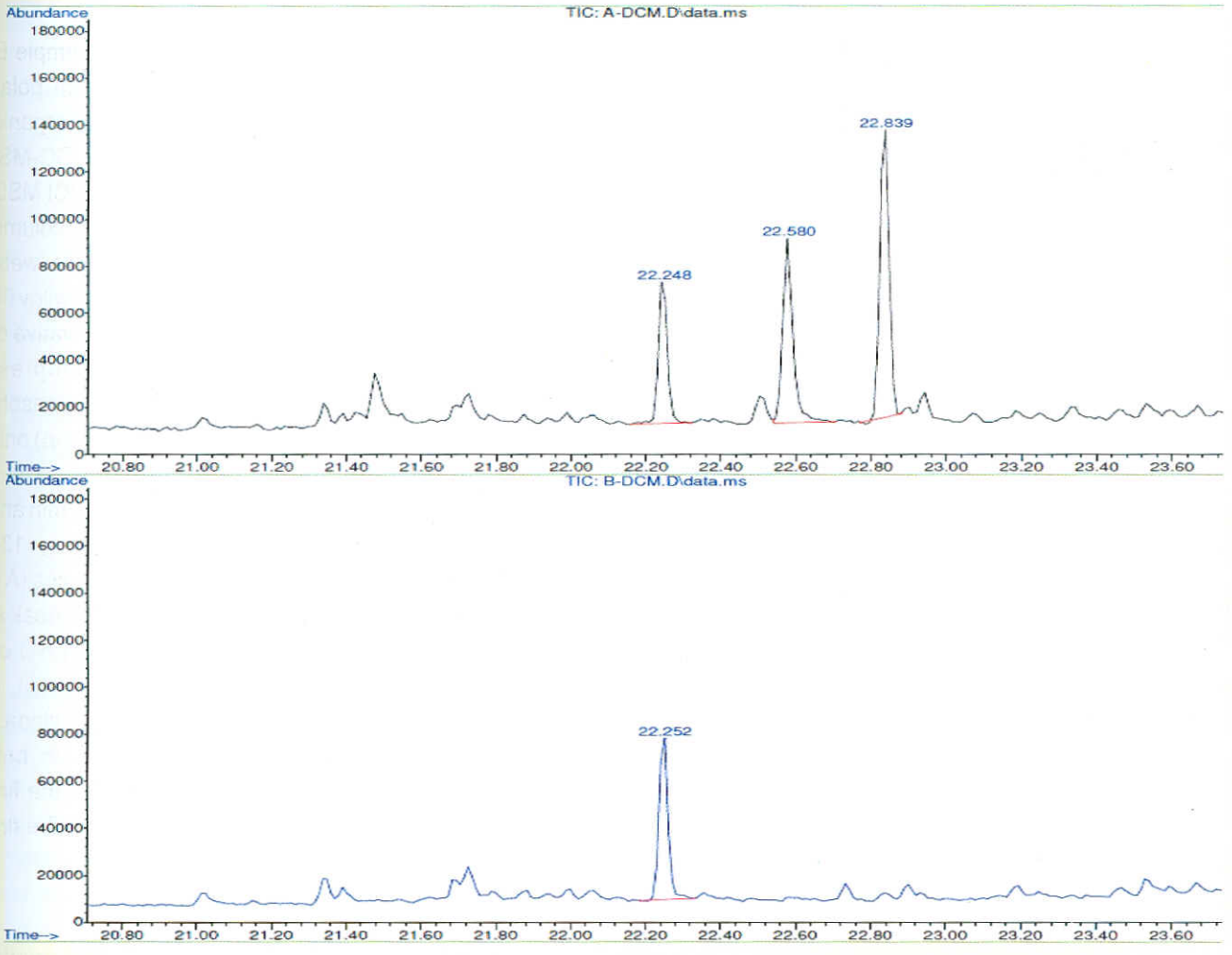


Fig-13. GC-MS results showing difference in peaks (RT 22.580 min- Androst-16-en-3-ol, and RT 22.839 min -] Androst-16-en-3-one), in poll gland secretion of breeding season, (Sample A) than non-breeding season (Sample B)

AR-4. Project: Identification of factors responsible for reproductive disorders and development of technology for countering the same

Sub-project :To study the reproductive status of female camels beyond the traditional limits of breeding season and during early post parturient period

Sub-project Leader : Sumant Vyas

Associate : U. K. Bissa

Reproductive status before breeding season: The female camels which did not conceived in the breeding season 2008-09 were examined in the month of September, 2009. The reproductive status is shown in Table-20.

Most of the breed-able males were engaged in the experiment on Camel pox or Nutrition. Therefore only five males were available for augmentation of rut. Therefore the females were found with follicle but due to non-availability of good numbers of virile males the number of conceptions in the month of October and November were less than last year. There is reduction of on an average 36 days of calving interval in these four camels. (Table-21). It is recommended that breeding camels should not be used for any experiment other than breeding/reproduction after September.

Table-20. Reproductive status of female camels prior to breeding season

S.N.	Breed	*No. of camels*			Pregnant on	
		Examined	With follicle	Mated	10/1/09	18/3/09
1	Bikaneri	6	5	5	1	1
2.	Jaisalmeri	6	5	5	1	1
3.	Kachchi	7	6	5	1	1
	Total	19	16	15	3	3

Table-21. Female camels pregnant out of non-traditional breeding during Oct. and Nov., 2009

S.N.	Female	Male	Date of mating	Pregnant on dated		Calving interval reduced in comparison to 10/12/09
				10/1/09	18/3/10	
	Bikaneri					
1	463	622	7/10/09	N	N	
2	585	692	13/10/09	N	N	
3	567	692	18/10/09	N	N	
4	583	622	23/10/09	N	N	
5	509	692	27/11/09	P	P	12 days
	Kachchhi					
1.	121	142	16/10/09	N	N	
2.	109	142	7/10/09	N	N	
3.	143	142	11/10/09	N	N	
4	159	142	23/10/09	P	P	48 days
5	107	142	19/10/09	N	N	
6	141	142	18/11/09	P	P	22 days
	Jaisalmeri					
1	85	218	7/10/09	P	P	63 days
2	109	244	14/10/09	N	N	
3	93	218	11/10/09	N	N	
4	117	218	16/10/09	N	N	
5	107	244	18/10/09	N	N	
						Mean 36 days

* K 159 was mated and got pregnant out of the experiment of an M.V.Sc. student working in the camel reproduction unit

Post-parturient breeding: This is non-traditional breeding not practiced in the field as well as organized farms. The camels were mated during 30-70 days after calving in the same breeding season. This year 10 females were examined and mated out of which 6 conceived (Table-22). There will be reduction of calving interval of 300 days in these she camels. The calving out of post-parturient breeding (2008-09) and the lactation yield of such camels are shown in table-23 and 24.

Table-22. The camels conceived in post-parturient breeding during 2009-2010

S. N.	Camel No	Date of parturition	Date of service	Stud	Pregnancy status
1.	B 457	19/10/09	16/12/09, 5/1/2010	B 602	P
2.	B 573	6/10/09	16/12/09, 5/1/10, 26/1/10	B 602	P
3.	B 561	3/11/09	16/12/09, 5/1/10, 26/1/10, 20/2/10, 16/4/10	B 602	P
4.	K 133	15/11/09	2/1/10, 4/3/10	K 142	NP
5.	K 105	14/12/09	22/1/10	K 142	P
6.	J 127	16/10/09	20/12/09, 23/1/10, 26/2/10	J 228	P
7.	J 115	18/1/10	8/3/10, 22/4/10	J 228	NP
8.	J 393	1/1/10	20/2/10, 22/4/10	J 218	NP
9.	J 219	7/1/10	26/4/10	J 242	NP
10.	J 161	23/1/10	26/4/10	J 218	P

Table-23. The details of calving of the camels conceived in 2008-09 as a result of early post parturient breeding

S. N.	Camel	Date of previous parturition	Date of Conception	Date of II parturition	Calving interval(days)
1.	B 551	4/1/09	27/3/09	26/3/10	447
2.	B 483	21/1/09	3/3/09	20/3/10	424
3.	B 439	2/2/09	13/3/09	22/3/10	414
4.	B 467	20/2/09	27/3/09	3/5/10	438
5	J 389	7/1/09	13/3/09	28/3/10	446

Average calving interval is 434 days.

Use of hCG preparation in infertility treatment: Nine female camels, which did not conceive during breeding season 2009-10 even after four service were examined. It was found upon rectal examination that internal genitalia are apparently normal and no abnormality was revealed. Since anovulation is one of the causes of repeat breeding in the organized farms where animals are mated under controlled condition and not on their own, inj Pubergen-HP 5000 IU (Highly purified hCG) was tried in nine camels at the time of mating in the month of April, 2010. Three out of nine (J 117, K 83, K 153) are tentatively diagnosed as pregnant.

Table-24. The lactation yield (litres, two teat milking, twice a day) of two camels, which reconceived in the early post parturient period

Camel	Date of calving	Date of Conception	Not milked	Mar	Aprl.	May	June	July	Aug	Sept	Oct.	November
B 551	4/1/09	27/3/09	Jan- Feb	35.6	57.6	72.1	57.3	45.1	26.7	5.7 (1/15-15/9)		
B 439	2/2/09	13/3/09	Feb	70.6	92.2	103.8	89.1	83.3	75.4	51.1	13 (1-16/10)	
B 467	20/2/09	27/3/09	Feb-Mar	4.2 (4 days)	80.2	96.2	88.9	80.4	85.2	64.9	35	2.8(1-4/11)
J 389	7/1/09	13/3/09	Jan-Feb	70.7	90.5	116.3	115.4	105	93.6	73	51.4	

Unit: Animal Biochemistry

AR-2.Project: Studies on the biochemical parameters of semen for increasing its efficacy

Project Leader : Gorakh Mal

Associates : Sumant Vyas and D. Suchitra Sena

Camel seminal plasma samples were analyzed to determine the concentrations of various biologically

important biochemical parameters *viz.*, glucose, total protein, aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactate dehydrogenase (LDH), alkaline phosphatase (ALP), acid phosphatase (ACP), cholesterol and total lipids. The concentrations of glucose, cholesterol and total lipids were 2.97±0.21, 14.04±0.58 and 56.52±1.40 mg/dl respectively. Total protein in the seminal plasma was 0.86±0.12g/dl. The concentrations of AST, ALT, LDH, ALP, ACP (total) and ACP (non-prostatic) were 17.92±2.32, 5.61±1.03, 142.67±9.28, 411.25±36.27, 88.01±8.92 and 25.25±3.76 U/L respectively (Table-25). Semen samples were incubated either with buffer containing 20mM TRIS+8M Urea+33mM DTT or with 2.5M guanidine-HCL at 37**C** for 5-30 min. for disruption of seminal clot and for the induction of liquefaction. No visible effect on seminal clot has been noticed with buffer, but guanidine-HCL showed a partial disruption of seminal clot after 20-30 min. Induction of liquefaction with other denaturing agents and proteolytic enzymes is in progress.

Time course study was carried out to identify the proteins involved in the process of coagulation and liquefaction. Fresh seminal plasma samples (0h) and aliquots were taken at different time intervals (24h, 48h, 60h, 72h and 84h) and mixed with equal volume of 1% SDS. Samples were subjected to SDS-PAGE (Fig - 14). The proteins (un-fragmented and fragmented) involved in the process of coagulation and liquefaction of the camel semen have been identified as the nerve growth factors (NGF; Fig- 15).

Table-25. Concentrations of various parameters in the seminal plasma samples (n=26)

Parameter	Mean±S.E.	Range
Total Protein (g/dl)	0.86±0.12	0.34-3.14
Glucose (mg/dl)	2.97±0.21	0.85-5.21
Cholesterol (mg/dl)	14.04±0.58	10.03-19.42
Total lipids (mg/dl)	56.52±1.40	47.28-76.18
AST (U/L)	17.92±2.32	3.68-42.69
ALT (U/L)	5.61±1.03	0.89-17.52
LDH (U/L)	142.67±9.28	44.91-199.56
ALP (U/L)	411.25±36.27	100.60-666.20
ACP total (U/L)	88.01±8.92	26.25-190.95
ACP non-prostatic (U/L)	25.25±3.76	6.20-73.20

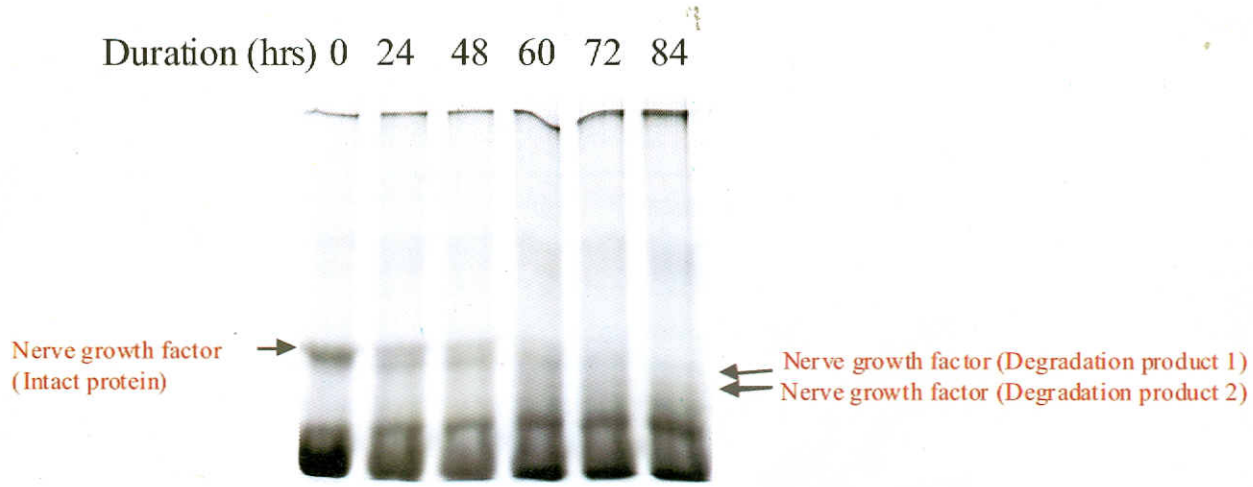


Fig-14. Camel seminal plasma samples run on 10% gel. Lane-1, 0h; 2, 24h; 3, 48h; 4, 60h; 5, 72h and 6, 84h.

```
1   meaamveemv imlikanvkl pvhpvqqlfs aldfslglpq elykmliprq hsrtvklesl
61  egtiihplen mvkcpsnass llpeswpmvv qsrgldgmld prsaqrlgpi tafpreqlsv
121 latsskatga vrthafwlhi simgtlsvfg pnlpdaqkpe kptmkiikcp gvpqcqdvwl
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241 qeeeeeeagf sqpweprltn tndsnslsqs lapesltalg ttplrqelsp sldsappqvh
301 svmsmlfytl italligira ephpeshvpa ghaiphahwt klqhsldtal rrarsapaga
361 iaarvtgqtr nitvdpklfk krrlrsprvl fsthpppvaa daqdldleag stasvnrthr
421 skrssshpvf hrgefsvcds vsvwvgdktt atdikgkevm vlgevninns vfkqyffetk
481 crdptpvdsg crgidskhwn syctttht fv kaltmdgkqa awrfiridta cvcvlsrkag
541 rra

1  ligiqaepht esnvpaghai pqahwtklqh sldtalrrah sapagansar vagqtrnitv
61 dpklfkkrrl rsprvlfstq pppvaadtqd pdleasgaas fnrthrskrs sshpvfhrge
121fsvcdsvsvw vgdkttatdi kgkevmvlge vninnsvfkq yffetkcrdp npvdsgcrgi
181dskhwnsyct tthtfvkalt mdgkqaawrf iridtacvcv lsrkagrra
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Fig-15. Amino acids sequence of nerve growth factors. Data in bold indicates that the protein hit ranked number one in the list of possible sequences

AP-3.Project :Processing, value addition and commercialization of different camel products and by-products

Project Leader : Gorakh Mal

Associates : Champak Bhakat and D. Suchitra Sena

Camel milk powder: Camel milk powder was prepared by lyophilizing the raw, pasteurized and boiled camel milk. Camel milk powder is white in color with normal odor and salty taste (Fig-16). Highest yield was observed for the powder prepared with boiled camel milk followed by pasteurized camel milk. Moisture, protein, fat, ash and acidity (%) in various types of milk powder were 5.60-7.03, 23.22-23.96, 23.12-23.43, 7.28-7.75 and 1.87-1.97 respectively (Table-26). Sensory evaluation was carried out for the powder prepared from pasteurized and boiled camel milk. Smell, color, body, taste and overall acceptability were found to be almost same in both types of lyophilized powder (Table- 27).

Fig-16. Lyophilized camel milk powder

Table-26. Chemical composition of lyophilized camel milk powder

Component	Raw	Pasteurized	Boiled
Recovery (%)	9.88±0.45	10.50±0.27	12.06±0.43
Moisture (%)	7.03±0.26	6.65±0.25	5.60±0.18
Protein (%)	23.96±0.48	23.33±0.41	23.22±0.53
Fat (%)	23.12±0.46	23.20±0.38	23.43±0.31
Ash (%)	7.75±0.11	7.28±0.13	7.60±0.16
Acidity (%)	1.97±0.20	1.93±0.06	1.87±0.16

Table-27. Sensory evaluation of powder made from camel milk using Hedonic scale (9: most desirable, 5: optimum, 1: most undesirable)

Source	Smell	Color	Body	Taste	Overall acceptability
Pasteurized	6.83±0.31	8.08±0.20	7.17±0.40	6.75±0.33	7.25±0.13
Boiled	6.75±0.17	8.00±0.14	7.08±0.27	6.67±0.22	7.21±0.09

Camel milk khoa or mawa: Khoa was prepared from camel milk. Hot mawa has butter-like consistency, after cooling; it turns into semi-solid dough (Fig-17). No change in taste has been observed up to 30 days at refrigerated temperature. After addition of sugar, it can be kept for longer periods. Moisture, protein, fat, ash and acidity (%) in camel milk mawa were 28.21±1.04, 22.72±0.52, 17.57±0.23, 7.72±0.13 and 0.63±0.03 respectively (Table- 28). Smell, color, body, taste and overall acceptability for camel milk mawa were found to be 7.43±0.34, 6.94±0.45, 7.37±0.37, 7.62±0.46 and 7.28±0.29 respectively (Table- 29).

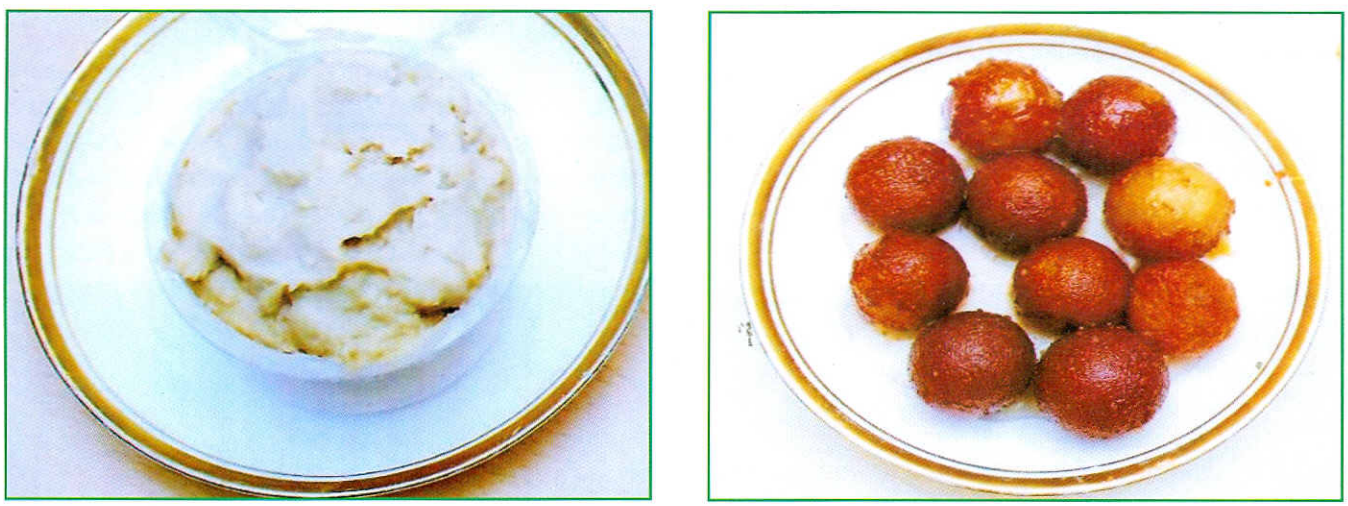


Fig-17. Camel milk mawa and gulab jamun

Camel milk gulab jamun: Gulab jamun was prepared from camel milk khoa or mawa (Fig-17). Moisture, protein, fat, ash and acidity (%) in camel milk gulab-jamun were 19.92±0.54, 5.66±0.15, 2.97±0.21, 4.23±0.08 and 0.18±0.01 respectively (Table- 3). Smell, color, body, taste and overall acceptability for camel milk gulab-jamun were found to be 7.61±0.17, 8.28±0.16, 7.71±0.19, 7.93±0.29 and 7.97±0.15 respectively (Table-4).

Camel milk barfi: Camel milk barfi was prepared from camel milk khoa (Fig-18). Mawa barfi can be used for at least 3-4weeks without any change in the taste at room temperature and more than 3 months, when stored at refrigerating temperature. Moisture, protein, fat, ash and acidity (%) in camel milk barfi were 6.32±0.31, 13.96±0.26, 9.78±0.51, 4.01±0.13 and 0.55±0.03 respectively (Table- 28). Smell, color, body, taste and overall acceptability for camel milk barfi were found to be 7.15±0.45, 7.23±0.54, 7.54±0.33, 6.85±0.65 and 7.04±0.30 respectively (Table- 29).

Fig-18: Camel milk barfi

Table-28. Chemical composition of mawa, gulab-jamun and barfi prepared from camel milk

Component	Mawa	Gulab-Jamun	Barfi
Recovery (%)	18.08±0.69	-	-
Moisture (%)	28.21±1.04	19.92±0.54	6.32±0.31
Protein (%)	22.72±0.52	5.66±0.15	13.96±0.26
Fat (%)	17.57±0.23	2.97±0.21	9.78±0.51
Ash (%)	7.72±0.13	4.23±0.08	4.01±0.13
Acidity (%)	0.63±0.03	0.18±0.01	0.55±0.03

Table-29.Sensory evaluation of powder made from camel milk using Hedonic scale (9: most desirable, 5: optimum, 1: most undesirable)

Source	Smell	Color	Body	Taste	Overall acceptability
Mawa	7.43±0.34	6.94±0.45	7.37±0.37	7.62±0.46	7.28±0.29
Gulab-Jamun	7.61±0.17	8.28±0.16	7.71±0.19	7.93±0.29	7.97±0.15
Barfi	7.15±0.45	7.23±0.54	7.54±0.33	6.85±0.65	7.04±0.30

Assessment of commercial viability of camel milk and its value added products: Camel milk and milk products *viz*., kulfi, flavored milk, lassi, tea and coffee were prepared and sold in the camel milk parlour started by NRCC. Sale and profit from the camel milk and its products was highest in December 2009 (Fig- 19). Camel milk and its products were sold for Rs. 2,51,514/- during the year and net profit of Rs. 1,18,105/- was realized (Fig- 20). Raw camel milk was also sold through milk parlour for Rs. 68,400/- to NGO "Baba Farid Centre for Special Children, in Faridkot and Bhatinda (Punjab).

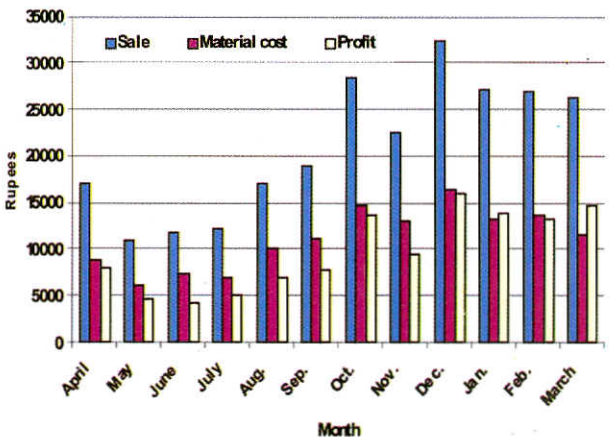


Fig-19. Month-wise sale, material cost and profit from camel milk parlour

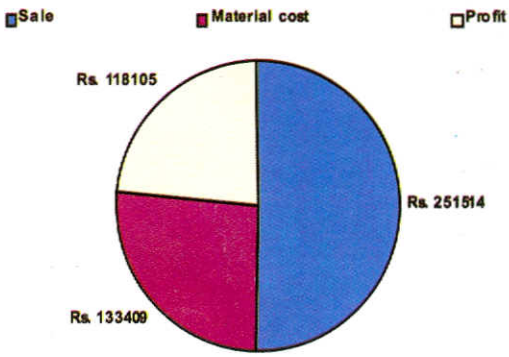


Fig-20. Net profit (in Rs) from camel milk and its products from April 2009-March 2010

AP-5.Project :Evaluation of camel milk for its therapeutic value and its exploitation as functional food

Project Leader : Gorakh Mal

Associate : D. Suchitra Sena

Camel milk samples were collected from 8 early, mid and late lactating camels belonging to four different breeds and 4 cow milk samples procured locally. Milk samples were heated at different temperatures (°C) (63°C, 70°C, 80°C, 90°C and boiled) for 30 minutes. Whey was separated from the heated/boiled and raw milk samples. Simultaneously, whey from the cow milk was separated. Average whey proteins concentration in raw camel milk during early, mid and late lactation were 0.930.02, 0.90±0.03, 1.02±0.03 percent, 1.250.01, 1.240.02, 1.33±0.01 percent, 0.94±0.01, 0.98±0.01, 1.07±0.01 percent and 0.97±0.01, 0.98±0.02, 1.06±0.01 percent respectively in Bikaneri, Jaisalmeri, Mewari and Kachchhi camels (Tables 30-32). In Bikaneri, Jaisalmeri, Mewari, Kachchhi and cow milk samples, whey proteins denaturation during early, mid and late lactation at 63C was 18.48, 10.00, 11.76%; 4.00, 21.77, 18.04%; 19.15, 7.14, 11.21%; 23.71, 6.12, 11.32% and 18.75, 14.28 and 29.41% respectively (Fig.21-23). Whey proteins denaturation during early, mid and late lactation at 80°C was 35.87, 26.67, 36.27%; 22.40, 39.52, 43.61%; 36.17, 33.67, 42.05%; 48.45, 32.65, 41.51% and 56.25, 50.79 and 54.41% respectively, in Bikaneri, Jaisalmeri, Mewari, Kachchhi and cow milk samples (Fig. 21-23).

Table-30. Whey proteins (%) levels at different temperatures (°C) in early lactation milk samples

	Breeds				
Temperature	Bikaneri	Jaisalmeri	Mewari	Kachchhi	Cow
Raw	0.93±0.02	1.25±0.01	0.94±0.01	0.97±0.01	0.48±0.01
63°C	0.75±0.01	1.200.01	0.76±0.01	0.74±0.02	0.390.01
70°C	0.67±0.01	1.10±0.04	0.670.02	0.61±0.01	0.30±0.01
80°C	0.59±0.01	0.970.01	0.60±0.01	0.50±0.01	0.210.01
90°C	0.53±0.01	0.84±0.01	0.530.01	0.44±0.01	0.15±0.01
Boiled	0.32±0.01	0.800.01	0.31±0.01	0.33±0.02	0.100.01

Table-31. Whey proteins (%) levels at different temperatures (°C) in mid lactation milk samples

	Breeds				
Temperature	Bikaneri	Jaisalmeri	Mewari	Kachchhi	Cow
Raw	0.90±0.03	1.24±0.02	0.98±0.01	0.98±0.02	0.63±0.01
63°C	0.81±0.01	0.97±0.01	0.91±0.02	0.92±0.01	0.54±0.01
70°C	0.74±0.01	0.87±0.02	0.79±0.02	0.80±0.01	0.42±0.01
80°C	0.66±0.02	0.75±0.01	0.65±0.01	0.66±0.01	0.31±0.01
90°C	0.57±0.01	0.70±0.01	0.58±0.02	0.57±0.01	0.21±0.01
Boiled	0.34±0.01	0.60±0.01	0.41±0.03	0.42±0.01	0.11±0.01

Table-32. Whey proteins (%) levels at different temperatures (°C) in late lactation milk samples

	Breeds				
Temperature	Bikaneri	Jaisalmeri	Mewari	Kachchhi	Cow
Raw	1.02±0.03	1.33±0.01	1.07±0.01	1.06±0.01	0.68±0.01
63°C	0.90±0.02	1.09±0.01	0.95±0.01	0.94±0.01	0.48±0.01
70°C	0.75±0.01	0.82±0.01	0.78±0.01	0.79±0.01	0.43±0.01
80°C	0.65±0.01	0.75±0.01	0.62±0.01	0.62±0.01	0.31±0.02
90°C	0.56±0.01	0.59±0.01	0.53±0.01	0.54±0.01	0.22±0.01
Boiled	0.29±0.01	0.49±0.01	0.33±0.01	0.35±0.01	0.18±0.03

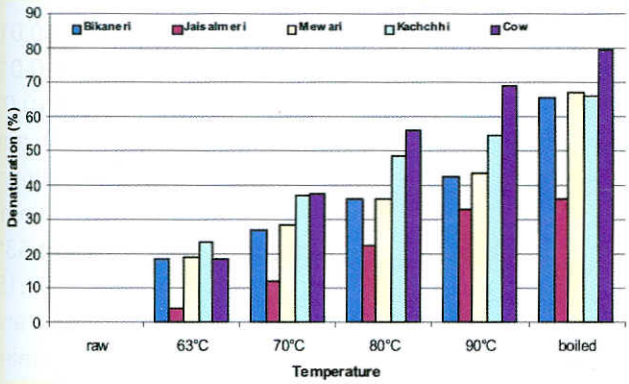


Fig-21. Whey proteins denaturation (%) during early lactation at different temperatures

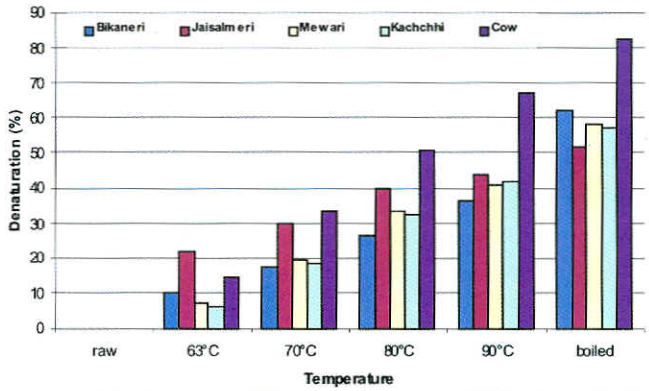


Fig- 22. Whey proteins denaturation (%) during mid lactation at different temperatures

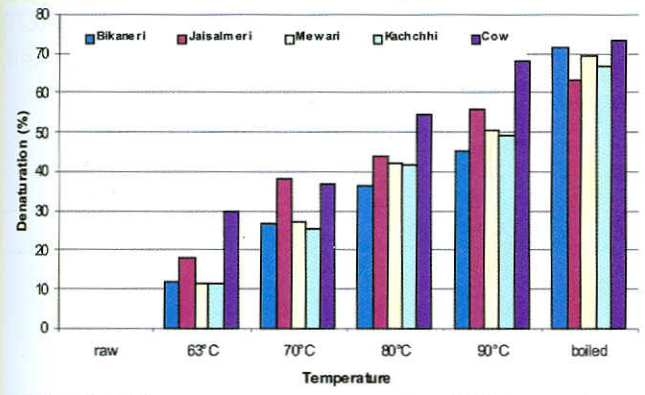


Fig-23. Whey proteins denaturation (%) during late lactation at different temperatures

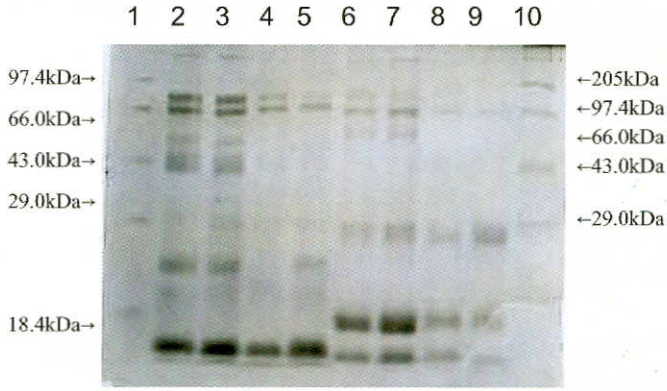


Fig-24. Comparisons of camel (B-455) and cow milk whey proteins denaturation during early lactation. Lanes 1 and 10: Marker; Lanes 2-5 of B-455 (lane 2: raw; lane 3: 63˚C, lane 4: 80˚C, lane 5: 90˚C. Lanes 6-9 of cow (lane 6: raw; lane 7: 63˚C, lane 8: 80˚C, lane 9: 90˚C)

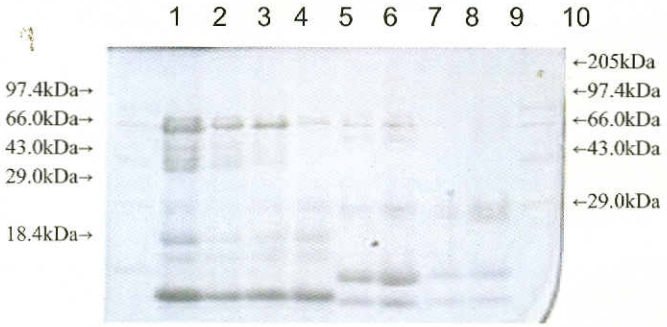


Fig-25. Comparisons of camel (J-65) and cow milk whey proteins denaturation during early lactation. Lanes 1 and 10: Marker; Lanes 2-5 of J-65 (lane 2: raw; lane 3: 63˚C, lane 4: 80˚C, lane 5: 90˚C. Lanes 6-9 of cow (lane 6: raw; lane 7: 63˚C, lane 8: 80˚C, lane 9: 90˚C)

The whey samples were subjected to SDS-PAGE. In camel milk, the whey proteins showed a pronounced heat effect only in the 90C sample, where bands intensity decreased without totally disappearing. No visible heat effect on camel milk whey proteins has observed for pasteurized and 80C samples. As a comparison, pasteurization of cow milk at 63C caused no visible change in whey proteins, while at 80C, 66kDa proteins disappeared. Preliminary investigations revealed that camel milk whey proteins are more heat resistant than the cow milk whey proteins (Fig. 24-27). Comparative studies indicated marked difference in whey protein profiles of camel and cow milk (Fig. 28). In cow milk 18.4kDa protein band is present, while absent in camel milk whey protein samples. 23kDa whey protein is expressed in camel milk and not in cow milk. This protein was sequenced and identified as Glycosylation-dependent cell adhesion molecule 1 (Fig- 29).

GenBank Publications : Twenty nine accessions have been published (GQ 183901-GQ 183929) in GenBank publication list at NCBI, USA during this year. Camel dairy microbial culture- was identified and characterized by 16 S rDNA finger printing isolated from camel milk cheese samples

GenBank Publications :

Accession Number	Title
GQ183901.1	Lactobacillus delbrueckii strain B -2-1 16S ribosomal RNA gene, partial sequence
GQ183902.1	Lactobacillus fermentum strain A-1-1 16S ribosomal RNA gene, partial sequence
GQ183903.1	Lactobacillus delbrueckii strain B -2-2 16S ribosomal RNA gene, partial sequence
GQ183904.1	Lactobacillus fermentum strain B -1-1 16S ribosomal RNA gene, partial sequence
GQ183905.1	Lactobacillus delbrueckii strain B -2-3 16S ribosomal RNA gene, partial sequence
GQ183906.1	Lactobacillus fermentum strain B -1-2 16S ribosomal RNA gene, partial sequence
GQ183907.1	Lactobacillus fermentum strain A -1-2 16S ribosomal RNA gene, partial sequence
GQ183908.1	Lactobacillus delbrueckii strain B -2-4 16S ribosomal RNA gene, partial sequence
GQ183909.1	Lactobacillus delbrueckii strain B -2-5 16S ribosomal RNA gene, partial sequence
GQ183910.1	Lactobacillus delbrueckii strain B -2-6 16S ribosomal RNA gene, partial sequence
GQ183911.1	Lactobacillus plantarum strain B -2-7 16S ribosomal RNA gene, partial sequence
GQ183912.1	Lactobacillus fermentum strain B -1-3 16S ribosomal RNA gene, partial sequence
GQ183913.1	Lactobacillus fermentum strain B -1-4 16S ribosomal RNA gene, partial sequence
GQ183914.1	Lactobacillus fermentum strain B -1-5 16S ribosomal RNA gene, partial sequence
GQ183915.1	Lactobacillus fermentum strain B-1-6 16S ribosomal RNA gene, partial sequence
GQ183916.1	Lactobacillus fermentum strain B -2-9 16S ribosomal RNA gene, partial sequence
GQ183917.1	Lactobacillus delbrueckii strain B -2-10 16S ribosomal RNA gene, partial sequence
GQ183918.1	Lactobacillus fermentum strain B -1-7 16S ribosomal RNA gene, partial sequence
GQ183919.1	Lactobacillus delbrueckii strain B -2-11 16S ribosomal RNA gene, partial sequence
GQ183920.1	Lactobacillus delbrueckii strain B -2-12 16S ribosomal RNA gene, partial sequence
GQ183921.1	Lactobacillus fermentum strain B -2-13 16S ribosomal RNA gene, partial sequence
GQ183922.1	Lactobacillus delbrueckii strain B -2-14 16S ribosomal RNA gene, partial sequence
GQ183923.1	Lactobacillus delbrueckii strain B -2-15 16S ribosomal RNA gene, partial sequence
GQ183924.1	Lactobacillus plantarum strain B -2-16 16S ribosomal RNA gene, partial sequence
GQ183925.1	Lactobacillus delbrueckii strain A -2-2 16S ribosomal RNA gene, partial sequence
GQ183926.1	Lactobacillus delbrueckii strain A -2-3 16S ribosomal RNA gene, partial sequence
GQ183927.1	Lactobacillus plantarum strain CM -2 16S ribosomal RNA gene, partial sequence
GQ183928.1	Lactobacillus delbrueckii strain A -2-5 16S ribosomal RNA gene, partial sequence
GQ183929.1	Lactobacillus delbrueckii strain A -2-7 16S ribosomal RNA gene, partial sequence

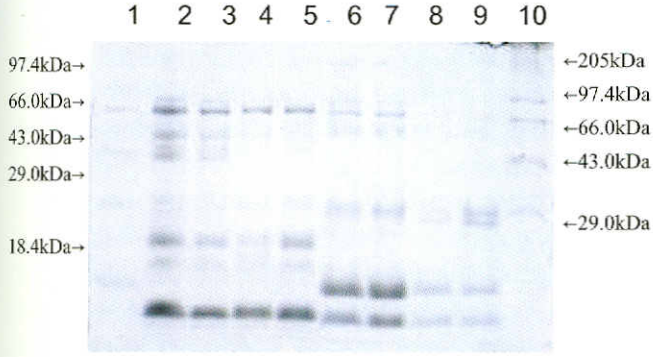


Fig-26. Comparisons of camel (M-13) and cow milk whey proteins denaturation during early lactation. Lanes 1 and 10: Marker; Lanes 2-5 of M-13 (lane 2: raw; lane 3: 63°C, lane 4: 80°C, lane 5: 90°C. Lanes 6-9 of cow (lane 6: raw; lane 7: 63°C, lane 8: 80°C, lane 9: 90°C)

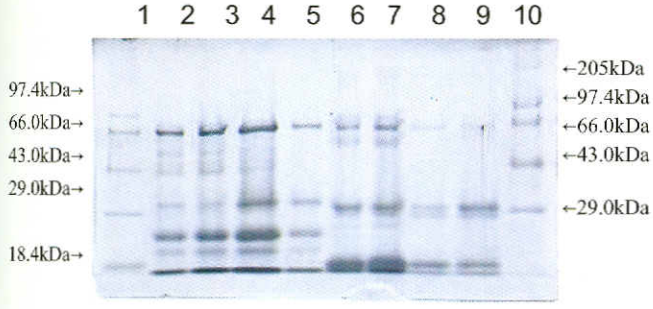


Fig-27. Comparisons of camel (K-123) and cow milk whey proteins denaturation during early lactation. Lanes 1 and 10: Marker; Lanes 2-5 of K-123 (lane 2: raw; lane 3: 63°C, lane 4: 80°C, lane 5: 90°C. Lanes 6-9 of cow (lane 6: raw; lane 7: 63°C, lane 8: 80°C, lane 9: 90°C).

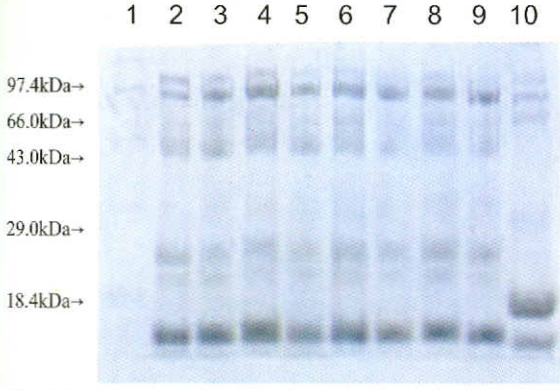


Fig-28. Comparisons of camel and cow milk whey proteins in raw milk during early lactation. Lane 1: Marker; Lanes 2-9 of camels (lane 2: B-455; lane 3: B-493, lane 4: J-65, lane 5: J-221, lane 6: M-13; lane 7: M-15, lane 8: K-79, lane 9: K-123 and lane 10: cow

1 MKFFAVLLLA SLAATSLASL NEPKDEIYME SQPTDTSAQV IMSNHQVSSE
51 DLSMEPSISR EDLVSKDDVV IKSARRHQNQ NPKLLHPVPQ ESSFRNTATQ
101 SEETKELTPG AATTLEGKLV ELTHKIIKNL ENTMRETMDF LKSLFPHASE
151 VVKPQ

Fig-29. Glycosylation-dependent cell adhesion molecule 1 (matched peptides shown in bold red)

AP-4.Project : Evaluation of anti-wrinkling property of camel milk cream in human

Project Leader(s): Prof. K.M.L. Pathak (Director, NRCC, Bikaner) and Prof. R.A. Bumb (Head, Department of Skin and V.D., S.P. Medical College, Bikaner)

Associates :Gorakh Mal (NRCC, Bikaner), R.D. Mehta, B. C. Ghiya and Renu Jakhar (Department of Skin and V.D., S.P. Medical College, Bikaner)

Camel milk cream prepared by NRCC was submitted to Department of Skin and V.D., S.P. Medical College, Bikaner for its evaluation as an anti-ageing agent. Study was conducted in 18 test group patients and 16 control group patients for 6 months. Test group patients used camel milk cream while control group patients used commercially available cream. Both the creams had softening, soothing and glowing effect but none of the patients showed any apparent, clinically evident anti-wrinkling/anti-aging effect.

Project :Identification, characterization and structural studies of proteins from camel milk

Sub-project :Structural and functional studies of camel Peptidoglycan recognition proteins

Sub-project Leaders: Prof. K. M. L. Pathak (NRCC, Bikaner) and Prof. T. P. Singh (AIIMS, New Delhi)

Associates : Gorakh Mal (NRCC, Bikaner), Pradeep Sharma, Sujata Sharma, P. Kaur and A. Srinivasan (AIIMS, New Delhi)

Lipo-polysaccharide molecules are present on the cell surface of gram negative bacteria and observed

to be inducer of the innate immunity in host cells. Peptidoglycan recognition proteins (PGRP) are known to bind LPS molecules to neutralize their immune response. Flow cytometry experiments have suggested the significant decrease in the LPS induced IL2 and TNF□secretion by blood lymphocytes in presence of PGRP. To understand the LPS binding site and pattern, the structure of the complex of PGRP was solved in complex with LPS. The complex was crystallized using 10% polyethylene glycol-3350 at pH 8.0. The crystals belong to orthorhombic space group I222 with a = 87.5Å, b = 100.8Å and c = 162.0Å, having four crystallographic molecules in the asymmetric unit, with identical structures for all molecules. The structure of PGRP consists of a central β-sheet with five β-strands, four parallel and one anti-parallel and three α-helices. Both the dimers are unique in nature as they have opposite faces exposed. In dimer AB, the PGN binding sites are exposed and non PGN sites are located at the interfaces whereas it is opposite in case of CD (Fig-30). The LPS unit was found to be present in the specific site formed by contributions from two molecules of PGRP at the interface of the dimer CD. It has been observed that the mono-meric protein is unable to bind LPS whereas in native dimer state is more conducive to the LPS recognition. The LPS binding site is composed of polar and hydrophobic side chains of resides from both molecule C and molecule D (Fig-31). The site is mainly composed of polar and hydrophobic residues present in the newly formed binding site.

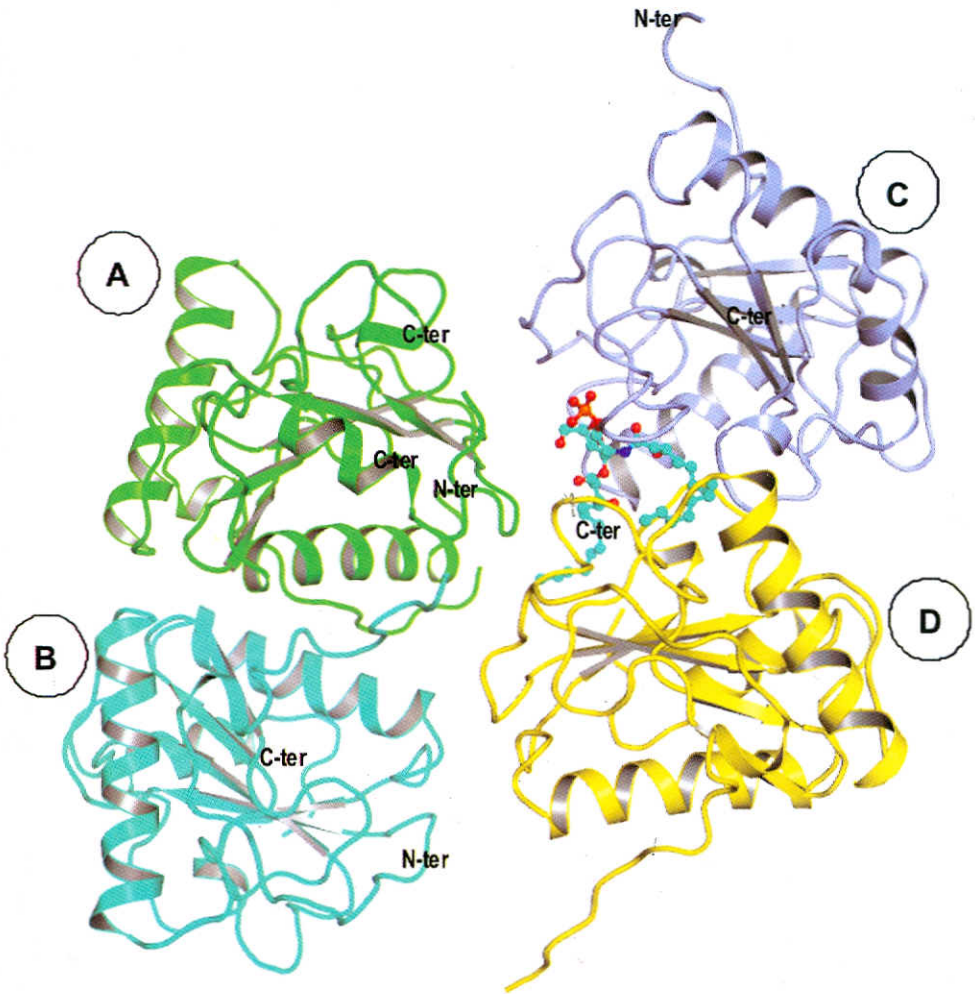


Fig-1. Overall structure of the complex

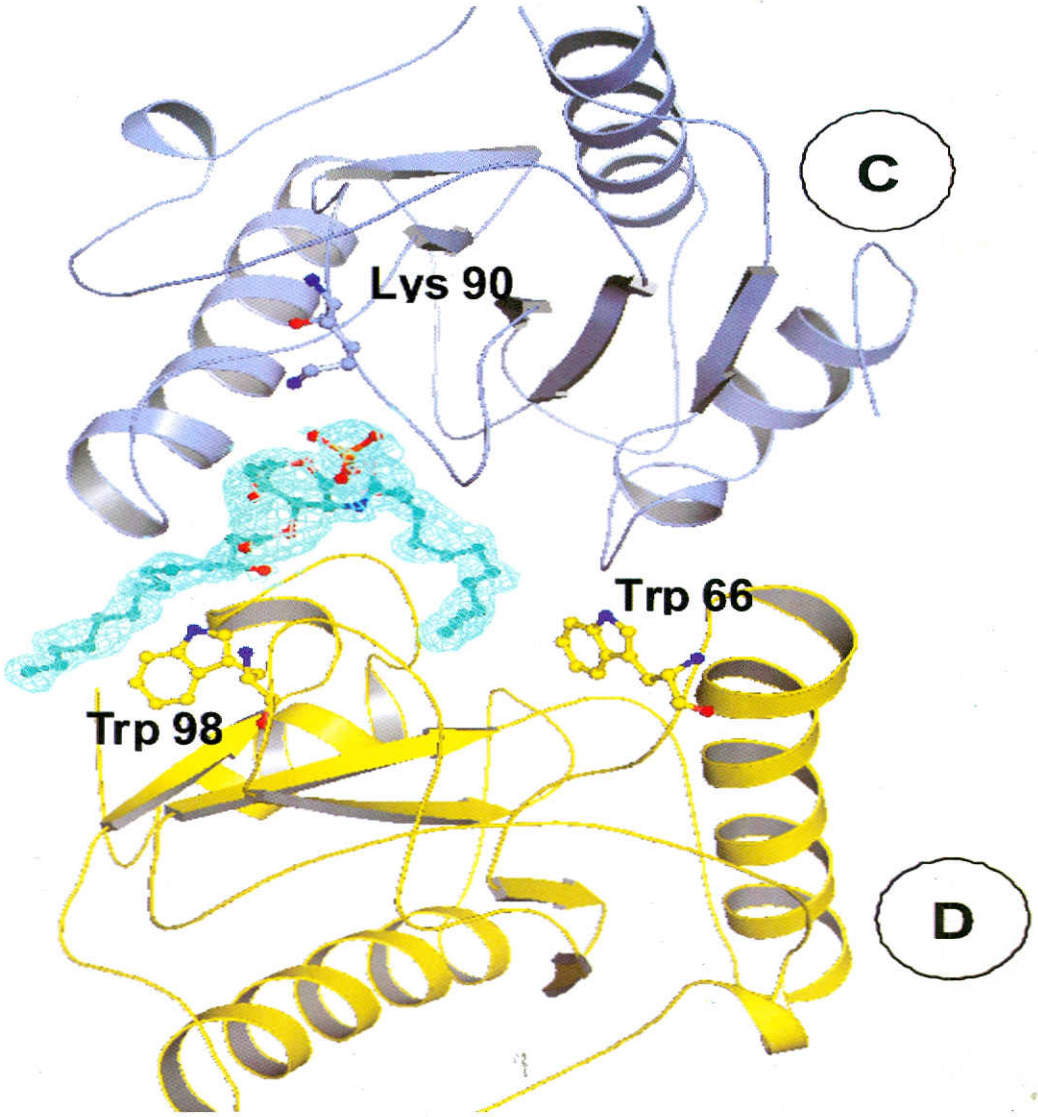


Fig-2. Electron Density map of the LPS bound to the PGRP molecules

Unit: Camel Management

LPM-1. Project : Development of appropriate camel management practices both for prevailing and impending climate change scenario

Sub-project : Studies on camel rearing practices in different system of management

Sub-project Leader : Champak Bhakat

Associates : Nirmala Saini and K. M. L. Pathak

The eight camel calves belong to 12 – 24 months aged are taken and divided into two comparable groups of management practices containing four calves in each group. Each of the group contained two camels of Bikaneri and Jaisalmeri breeds. The one male and three females are kept in both groups. The first group was reared under stall feeding management and the second group was reared under stall feeding with grazing management condition.

Table-33 represents serum biochemical attributes and minerals status of calves in different feeding practices. The analysis of results of biochemical attributes reveals that level of glucose, total protein, globulin significantly ($P<0.05$) increased in stall feeding with grazing management practices as compared to stall feeding management group. The level of albumin and urea are varied non-significantly between the groups. The analysis of results of minerals status reveals that serum calcium, phosphorus, zinc, iron level significantly ($P<0.05$) varied between two group of rearing practices with higher level in second group than first group. The level of magnesium, copper, manganese varied non-significantly between these two groups of practices. The hair mineral like calcium, zinc, iron, sulpher significantly ($P<0.05$) increased in second group as compared to first group. But the level of magnesium, copper and manganese varied non-significantly.

The average growth rate significantly ($P<0.01$) increased in the group which was in stall feeding with grazing management practices (316.67 ± 68.84 gm / day) as compared to stall feeding group (262.38 ± 62.18 gm / day). The comparative total body weight gain was found to be higher in stall feeding with grazing management practices (61.61 kg) than stall feeding group (51.09 kg) after 173 days of experimentation. The average fodder and water intake from manger was slightly higher in first group than second group. The total dry matter intake is 5.27 ± 0.61 kg /calf / day and the feed conversion efficiency was 12.75 ± 0.85 for stall feeding management practices.

The analysis of comparative morpho-metric of camel calves in different feeding management revealed that body length, heart girth, height at wither, neck length, leg length (front & hind) increased significantly ($P<0.01$) in stall feeding with grazing management practices as compared to stall feeding group. The hump circumference vertical also varied significantly ($P<0.05$) between two group of feeding practices. But hump circumference horizontal varied non-significantly.

The economic analysis of rearing of camel calves in two feeding management practices revealed that total feeding cost for 173 days is higher in 1st group than 2nd group. The total cost for per kg body weight gain was less and economical for stall feeding with grazing management as compared to stall feeding practices.

Sub-project: Service project on Extension, communication and human resource development

Sub-project Leader : Champak Bhakat

Associates : Gorakh Mal and K.M.L. Pathak

Camps for Scientific Exhibitions : During the period under report two exhibitions were organized as Marwar krishi utsav'09 at Jodhpur from 7.12.09 to 9.12.09 with the theme of "Recent advances of camel research and technical know-how" and Camel Festival, at KSS, Bikaner on 30.12.09 with the theme of "Utilization of value added products and technology" The latest technologies developed by centre were displayed & handouts were distributed free of cost in these exhibitions.

Transfer of technical know-how : Attempts have been made to transfer the technical know-how of electricity generation by camel and electrification of traditional two wheel camel cart. Efforts have been made to popularize the technical know-how of preparation of camel milk products in common people, farmers and other stake holders to disseminate it in the fast track. Flavored milk, tea/coffee, Kulfi of camel milk has provided to various national and international visitors.

A.T.M.A (NGO) Collaboration: We have attended 427 farmers from A.T.M.A, NGO and provided practical training and educational information on 16.4.09, 7.9.09, 15.9.09, 27.10.09, 28.10.09, 20.3.10, 22.3.10, 27.3.10,1.3.10 and also distributed extension literatures / booklets at free of cost.

Farmer's meet or kissan goshthi: Four farmer's meet / goshthies are conducted viz: at MKU, Jodhpur on 8.12.09, at NRCC on 8.1.10, At K.S.S, Bikaner on 30.12.09, at Meghasar village on 15.3.10. During the gosthi camel keepers were apprised about advance camel diseases, modern management practices followed at an organized farm.

Table-33: Serum biochemical attributes and minerals status of calves in different management practices.

Parameters	Stall Feeding Management		Stall Feeding with Grazing Management
Glucose (mg/dl)	76.52 ± 4.95	*	85.02 ± 5.20
Albumin (g/dl)	3.06 ± 0.14	NS	3.14 ± 0.23
Total Protein (g/dl)	4.29 ± 0.42	*	6.22 ± 0.29
Globulin (g/dl)	1.53 ± 0.19	*	3.06 ± 0.30
Urea (mg/dl)	36.09 ± 5.56	NS	33.31 ± 2.34
Serum minerals			
Calcium (mg/dl)	8.71 ± 0.46	*	10.76 ± 0.68
Magnesium (mg/dl)	3.25 ± 0.22	NS	3.77 ± 0.25
Phosphorus (mg/dl)	4.14 ± 0.31	*	5.57 ± 0.25
Copper (ppm)	1.2 ± 0.35	NS	1.6 ± 0.41
Zinc (ppm)	1.07 ± 0.25	*	1.65 ± 0.24
Manganese (ppm)	0.48 ± 0.21	NS	0.65 ± 0.13
Iron (ppm)	25.33 ± 2.74	*	32.50 ± 1.36
Hair minerals			
Calcium (mg/dl)	124.73 ± 10.44	*	176.60 ± 10.57
Magnesium (mg/dl)	79.25 ± 8.15	NS	89.12 ± 6.56
Zinc (ppm)	65.15 ± 1.84	*	70.80 ± 2.69
Copper (ppm)	4.10 ± 0.17	NS	4.22 ± 0.35
Iron (ppm)	274.00 ± 26.58	*	354.05 ± 21.58
Manganese (ppm)	23.00 ± 2.97	NS	18.80 ± 1.94
Sulpher (mg/dl)	6.77 ± 0.48	*	7.70 ± 0.71

* Significant at 5 %, NS : Non-significant.

Practical training and demonstrations: The practical training and demonstrations were provided to various grups of farmers (direct approach group) and students *viz.* 33 farmers from adopted village on 8.1.10; 35 farmers from Y.H.A.I, Jaisalmer on 8.2.10; 50 farmers from A.H. Department, Dungargarh, Bikaner on 18.2.10; 40 farm women from Krishi Vistar, Nagaur on 26.3.10; 30 farmers from Pashupalan Department, Sikar on 27.3.10; the internees of Apollo college of Veterinary Medicine from 6.4.09 and 25.4.09 and also 18.8.09 to 19.8.09; 25 participants from CIAH, Bikaner on 27.10.09; 303 N.C.C cadets and a large number of students from all over the country.

Collaboration : For different extension activities we are actively collaborating with the NGO "Samvedana Sansthan", Bikaner, CSWRI, Avikanagar, URMUL Trust and dairy, Bikaner, KVK, Beechhwal, Bikaner, LPPS, Sadri, Pali, ATMA Jaipur and RAU, Bikaner H.I.S, Jaipur etc. Efforts have been made for the popularization of technologies of the centre through a holistic approach.

Participation in Camel competitions etc: Our centre has also been awarded for some of the events of camel competitions at the Camel Festival - 2010.

Revenue generation programme : Revenue collection has significantly increased during the present year in comparison to previous year. All efforts have been made to strengthen our revenue generation and sizeable amount of revenue has been generated through various possible extension activities *viz.* entry fee, still photography, camel riding, milk products marketing etc. We have extended camel museum which is much more scientific and informative so that it can attract more number of tourists and generate more revenue for our centre.

During Mar '09 to Feb.'10 we have visited and organized camel health camps at Bikaner (Bajju, Phatuwala, Charanbala), Jaisalmer (Chandan, Dwara, Khetolai) and Udaipur (Dingri, Kejar, Sippur & Dunger) and Hanumangarh (Lollana) district and collected different biological samples from camels. The state animal fair of Gogamedi (Hanumangarh) had also been covered for this purpose. In animal fairs a large number of camels are brought from different parts of Rajasthan and adjoining states for trading.

Unit: Camel Health

VM-8. Project : Epidemiology of infectious diseases of camel

a. Sub-project: Epidemiology of bacterial and fungal diseases of camels

Sub-project Leader : F. C. Tuteja

There are mainly three skin infections in camels which are frequently observed in the field and termed as thikria, taat ki bimari and kharas by the local camel farmers. The survey work for the epidemiology of bacterial and fungal diseases of camels revealed the presence of these infections in camels.

Skin candidiasis or Thikria in dromedary camel calves: The small pieces of a broken earthen pitcher are termed as thikri in local language. Since the lesions of this skin infection grossly look like thikri, so this disease is termed as thikria by camel owners of Rajasthan. Thikria is an acute and contagious fungal infection of camel calves of less than one year of age. When infection occurs in a herd it affects almost every young calf in the group. Young calves at a well managed camel farm as well as in the field conditions were observed for this type of lesions. Prevalence of the disease and relevant management practices adopted by the farmers were also recorded.

Lesions of the disease: Lesions of the disease are initially observed on the back near the hump, which extend towards the abdomen later and may cover the whole body (Fig-32). Lesions are initially round in shape and measure less than a centimeter which enlarge to more than 10 cm in size and may coalesce. The lesions are hard and fibrous crusts with papules accompanying alopecia. Scraping the lesion with scalpel reveals foul smelling blackish brown dry crusts bunched with hairs along with roots. In prolonged cases it causes itching, uneasiness and may lead to bleeding and ulceration of skin (Fig-33) and may result in weakness and debility of

calves (Fig-34).

Prevalence of disease: Survey in camel populated areas revealed the prevalence of this disease everywhere in Rajasthan. Every farmer is of the view that it is a disease of self curing nature, and the healing occurs after rains. Self cure generally occurs during fur replacement. None of the calves born in the previous year had this infection, whereas in the same herd recently born calves had this infection. Lactating camels living in the close contact with their infected suckling off springs were not infected.

Economic loss: It is not believed to cause any mortality; however it is responsible for morbidity in the young suckling calves. The comparison of growth of five infected calves with seven healthy calves at one year of age at a well managed camel farm, revealed that physical condition of calves was severely affected. The average weight gain was less in infected calves (256.6±12.84 kg) while considering the age, sex and breed parity of calves, as compared to healthy calves (301.149±6.09 kg). These calves were maintained under same management conditions.

Causative agent: Skin tissue samples were collected form 15 infected camel calves. The tissues from active lesions were cut with sterilized scissors and scalpel. The samples were initially examined for fungus identification in 10% KOH. Each sample was processed for isolation and identification for fungi using Sabouraud's dextrose agar. These plates were incubated for 15 days at 25°C. The resultant growth was examined for the colony morphology. Microscopic examination was carried out using lactophenol cotton blue stain. Repeated culture of skin scrapings on Sabourads dextrose agar and germ tube formation in horse serum from all infected calves led to the isolation and conformation of *Candida albicans* (Fig.35-37).

Ethno-veterinary treatment: As ethno-veterinary treatment either sulphur in mustard oil, mustard oil alone or engine oil is applied by the farmers in the field conditions and the farmers find it very effective. Any oily base is mostly preferred by the farmers. Some farmers do apply pearl millet flour and salt in equal proportions in water as semisolid ointment and find it very effective.

Treatment: Treatment was carried out as per standard treatment procedure for fungal infection with slight modifications and incorporating the knowledge used by the farmers.

The following schedule was given in five severely affected cases of calves of approximately six month of age for the treatment of this condition. Initially entire dead tissue was removed by scraping and spray bath was made with 10 percent sodium thiosulphate starting the next day an ointment made of sulphur (6gm) and salicylic acid (3gm) mixed with mustard oil (100ml) was applied on the affected skin daily for five days. On the seventh day again spray bath was done with 10 percent sodium thiosulphate and the same ointment was applied daily for six days. Then skin scrap was removed and 10 percent sodium thiosulphate was applied daily for two days. Along with this treatment mineral mixture feeding was done daily for 30 days at the rate of 20 gm per calf per day. This treatment schedule resulted in complete recovery of lesions in all the five cases. Recurrence of the condition in these calves was not observed up to one year of age.

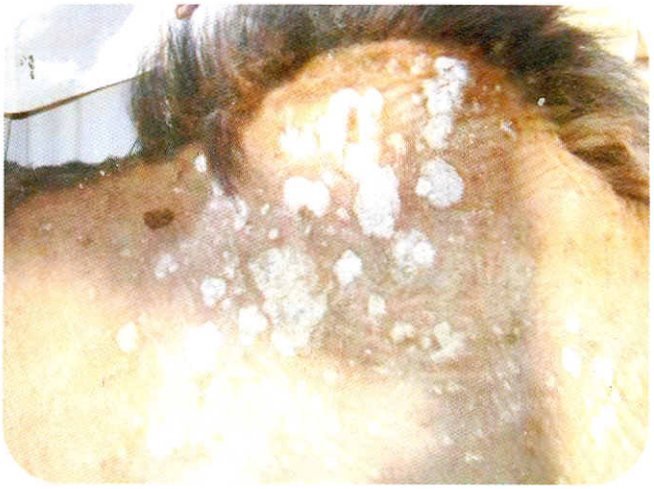


Fig-32. Initial stage of Thikria lesions

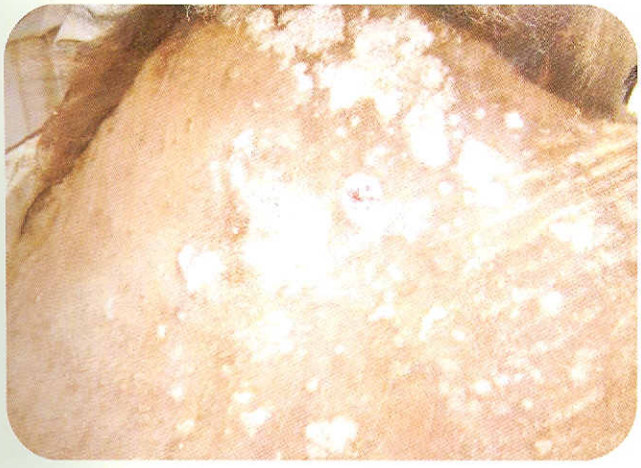


Fig-33. Initiation of bleeding from lesion

Fig-34. Weakness and debility of calf

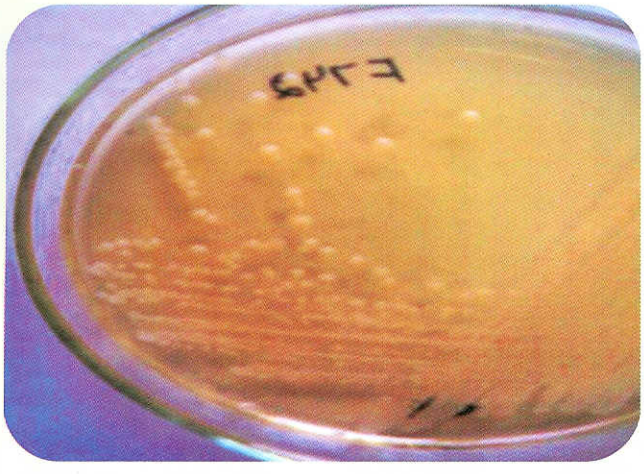


Fig-35. Creamish mucoid colonies of Candida at 24 hour

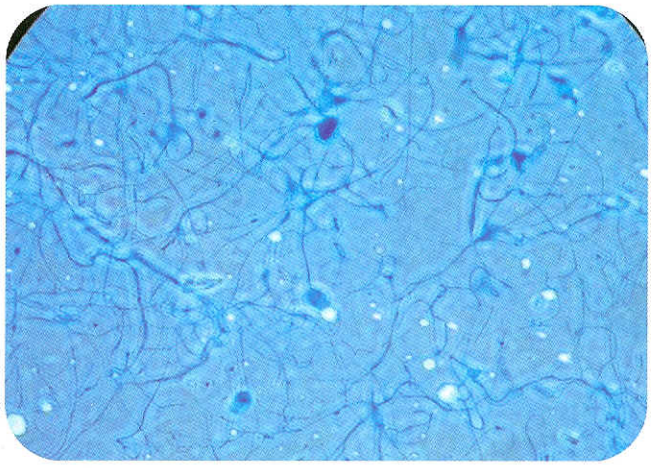


Fig-36. Candida (40x lactophenol cotton blue stain)

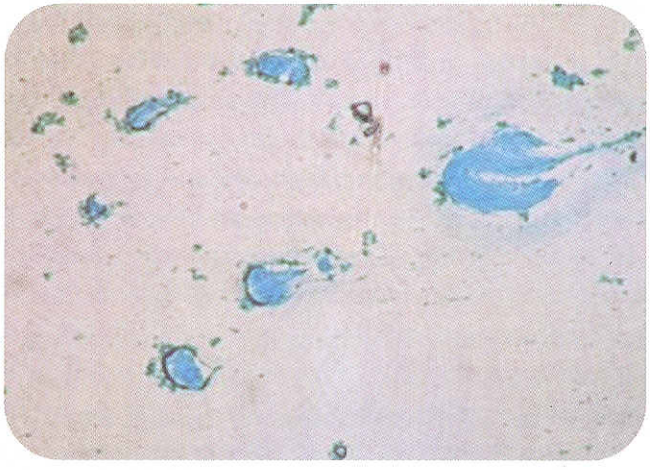


Fig-37. Germ tube formation of *Candida albicans* in horse serum

Cutaneous alterinariasis in dromedary camel: Tat is a Hindi word for thin gunny carpet made up of jute fiber and bimari stands for disease. During early winter when camel start growing fur, and the skin color resembles tat, that is why farmers call it "tat ki bimari". This is an acute and contagious skin necrosis more frequently in camel calves of one year age lesser in older animals. It may be quite confusing with ring worm since there is not any documented report about this disease in camel.

Lesions of the Disease: Lesions of this disease are observed throughout the body including the lips and udder. They start as small raised areas initially which give roughness to the affected skin. There appears a slight whiteness at the top of the raised skin area. Initially lesions are less than a centimeter in size which

may enlarge to more than 10 cm in size. The enlargement of the lesions occurs in centrifugal manner and later the lesions may coalesce. During development of the lesions necrosis follows alopecia. The general presentation is of circular alopecia, with erythematous margin and a thick desquamation. Finally the lesions are observed as white dry areas. Scrapping the lesion with scalpel reveals skin necrosis just like a layer of ash deposit about half a centimeter thick. In untreated cases it causes itching, uneasiness and may lead to bleeding and ulceration of skin, resulting in weakness and debility of calves (Fig.38-41)

Prevalence of disease: Survey of camel populated areas revealed its prevalence in semi arid climatic conditions (Udaipur and Hanumangarh) than arid climatic conditions (Bikaner and Jaisalmer). The disease was recorded in all seasons while occurring more at the end of autumn and early winter. It causes morbidity in the young calves in terms of reduced weight gain.

Causative agent: Repeated culture of skin scrapings on SDA from all infected calves lead to the isolation of Alternaria spp. (Fig.42-44).

Ethno-veterinary treatment: As ethno-veterinary treatment either with sulphur in mustard oil or leather ash in ghee is applied by the farmers and the farmers claim it to be very effective.

The following schedule was given in four severely affected cases of calves under one year of age for the treatment of this disease. Initially entire dead tissue was removed by scrapping. Then the ointment made of sulphur (6gm) and salicylic acid (3gm) mixed with mustard oil (100ml) was applied on the affected skin daily for seven days. This treatment resulted in complete recovery of lesions in all the four cases.

Kharas: This condition occurs in any age group of the animals and it is more prevalent during rainy and winter seasons. It is more frequently seen in the semi-arid rather than arid regions of Rajasthan. The lesions of the disease are found anywhere on the body but more pronounced on the abdomen and between legs. In such cases there is a complete alopecia of the affected portion, The specific etiology still needs to be explored (Fig.45-46).

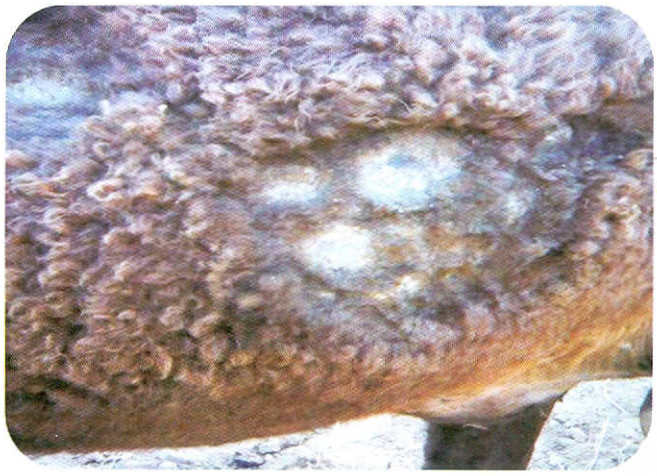


Fig.38. Lesions on the abdomen

Fig.39. Lesions on the thighs

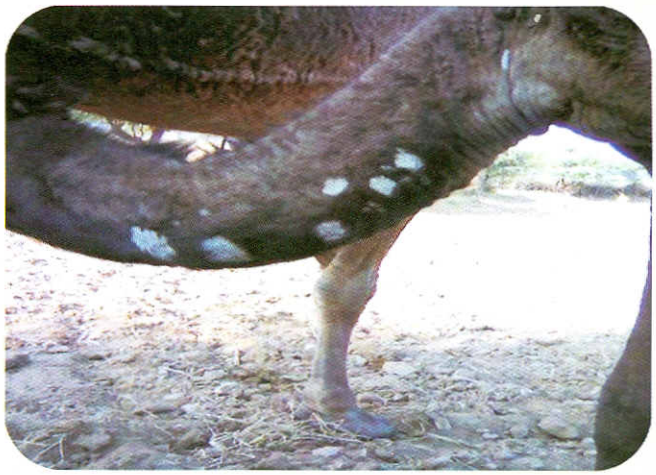


Fig.40. Lesions on the neck

Fig-41. Lesions on the lips

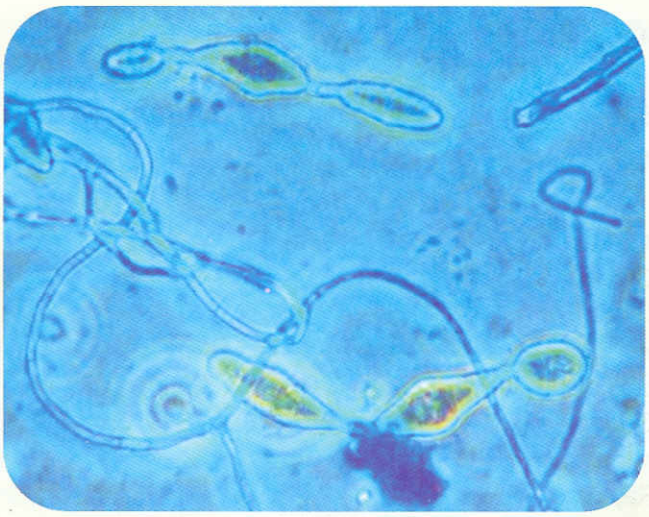


Fig-44. *Alternaria alternata* (40x lactophenol cotton

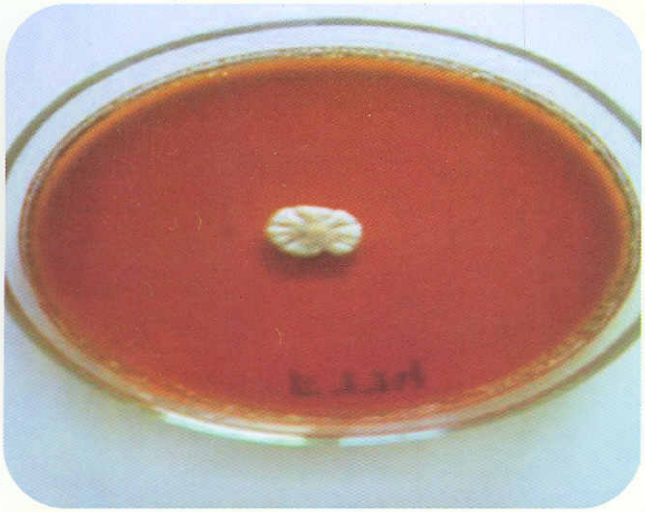


Fig-42. Colony of *Alternaria* spp. on SDA (Front 5th day)

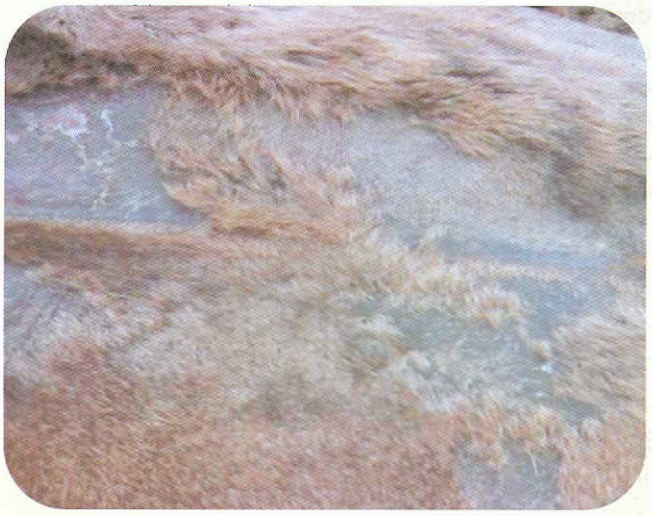


Fig-45. Lesions on the rump

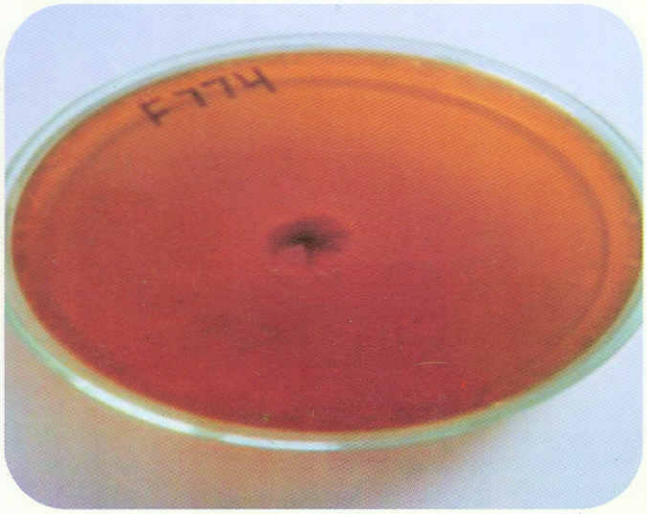


Fig-43. Colony of *Alternaria* spp. on SDA (Reverse 5th day)

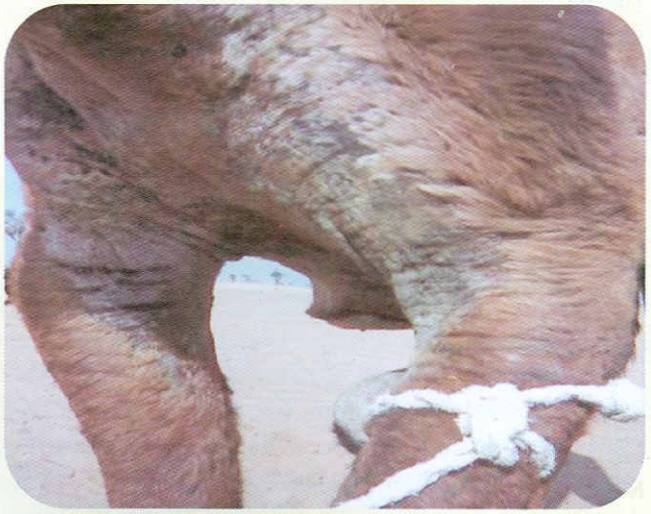


Fig-46. Lesions ventrally between the legs

b.Sub-project : Epidemiology of major parasitic diseases of camels

Sub-project Leader : S. K. Ghorui

Associates : G. Nagarajan and Sanjay Kumar

The camel health camps were organized during Mar '09 to Feb.'10 at Bikaner (Bajju, Phatuwala, Charanbala), Jaisalmer (Chandan, Dwara, Khetolai), Udaipur (Dingri, Kejar, Sippur & Dunger) and Hanumangarh (Lollana) districts to collect different biological samples from camels. The state animal fair of Gogamedi (Hanumangarh) was also covered. A large number of camels had gathered from different parts of Rajasthan and adjoining states for trading in the fairs.

Trypanosomosis in camel: Trypanosomosis was found to be the most prevalent disease of camel in all four districts especially during rainy and post rainy seasons. During laboratory examination – adopting wet smear, thin smear and thick smear examination of blood and gene specific PCR amplification (VSG gene), it was found that the sensitivity was more in the later case. It is reflected from the table-34 and 35 the figures within the bracket indicate number of positive samples by direct blood examination versus gene specific PCR amplification. Both male and female camels were susceptible to the infection.

Table-34.Prevalence of *Trypanosoma evansi* (by blood smear & PCR examination) in camels during different season

Seasons	Bikaner	Hanumangarh	Jaisalmer	Udaipur
Summer	36 (1*/2**)	78 (3/8)	58 (1/3)	65 (2/8)
Rainy	73 (0/5)	100 (1/11)	55 (0/4)	60 (0/1)
Winter	30 (0/3)	43 (0/2)	56 (1/3)	55 (2/5)
Total	139 (1/10)	221 (4/21)	169 (2/10)	180 (4/14)

* = positive by blood smear examination

** = positive by PCR examination

Table- 35. Sex-wise prevalence of *Trypanosoma evansi* by blood smear & PCR examination

Sl. No.	Name of places (District)	Total number of samples collected M/F	Total number of positive samples (By blood smear examination) M/F	Total number of positive samples (By PCR) M/F
1.	Bikaner	53/86	0/1	3/7
2.	Hanumangarh	85/136	1/3	6/15
3.	Jaisalmer	79/90	0/2	4/6
4.	Udaipur	82/98	2/2	6/8

Sero-prevalence of cameline surra: During the period under report 88 camels sera have been analyzed in duplicate for the presence of antibodies against typanosomes. Appropriate controls, like antigen control, antibody control, conjugate control were always included in the present study (Table-36). Besides new born camel calf serum and parasitological trypanosome positive camel serum were considered as negative and positive control, respectively.

Table-36: Plate data for Indirect ELISA (OD at 492nm) for cameline surra

Plate-I											
1	2	3	4	5	6	7	8	9	10	11	12
A 0.052	0.054	0.077	0.069	0.078	0.080	0.069	0.070	0.072	0.074	0.089	0.086
B 0.053	0.056	0.056	0.059	0.067	0.066	0.065	0.068	0.067	0.074	0.054	0.057
C 0.070	0.068	0.074	0.061	0.070	0.067	0.068	0.070	0.060	0.062	0.067	0.069
D 0.113	0.108	0.197	0.198	0.188	0.181	0.069	0.072	0.056	0.057	0.062	0.069
E 0.189	0.210	0.070	0.065	0.069	0.072	0.070	0.068	0.069	0.070	0.059	0.057
F 0.063	0.066	0.058	0.051	0.056	0.058	0.068	0.066	0.074	0.078	0.066	0.068
G 0.070	0.082	0.054	0.055	0.067	0.070	0.129	0.126	0.139	0.134	0.193	0.198
H 0.184	0.187	0.221	0.211	0.083	0.079	0.106	0.096	0.126	0.129	0.139	0.132

Note: A1&2 without Antigen, B1&2 without serum, C1&2 newborn calf serum, D1&2 Known positive Serum and rest well Test sera.

Plate- II											
1	2	3	4	5	6	7	8	9		10	11	12
A 0.053	0.059	0.185	0.189	0.185	0.187	0.228	0.230	0.126	0.128	0.223	0.231	
B 0.057	0.059	0.120	0.126	0.130	0.128	0.224	0.238	0.072	0.086	0.124	0.132	
C 0.085	0.087	0.123	0.129	0.062	0.074	0.149	0.152	0.066	0.076	0.252	0.254	
D 0.183	0.179	0.136	0.141	0.108	0.103	0.078	0.082	0.072	0.073	0.087	0.079	
E 0.197	0.199	0.054	0.057	0.076	0.072	0.080	0.089	0.068	0.072	0.087	0.089	
F 0.127	0.126	0.126	0.129	0.064	0.068	0.076	0.078	0.073	0.076	0.062	0.065	
G 0.118	0.117	0.094	0.102	0.054	0.060	0.071	0.073	0.056	0.059	0.056	0.061	
H 0.089	0.079	0.131	0.135	0.168	0.179	0.103	0.105	0.053	0.058	0.061	0.069	

Note: A1&2 Without Antigen, B1&2 without serum, C1&2 newborn calf serum, D1&2 Known positive Serum and rest well Test sera.

In this regard, the mean ELISA value for control was 0.058 and 0.066 at the dilution of 1:50 and for positive control (Parasitological) the value was 0.110 & 0.181 at the same dilution, for plate I & II, respectively. All together 14 sera samples showed the ELISA value above the level of known positive parasitological samples, other samples showed ELISA value far below the positive control samples (Table- 35). Antibodies to trypanosomes were found in samples from all the areas encountered. No agreement was found between results obtained by PCR assays and antibody ELISA which might be the results of antibody persistence even after successful chemotherapy, leading to high proportion of positive results, which are not necessary indicative of active carrier state of infection.

Mange in camel: Mange was also encountered as second prominent disease of camel in the present study. The following tables illustrated the number of camels and their age, different region visited in different seasons affected by the mange mite. It was revealed from the present study that camel got infection round the year and overall prevalence of mange found highest in Bikaner District followed by Udaipur District. It was also reflected from the present study that the younger camels of 1 to 3 years of age affected with Sarcopticosis mostly with major morbidity and this trend of infection was prevailed all the region visited (Table-37, 38 & 39).

Table-37. Prevalence of *M*ange (*Sarcoptic scabei*) in camels during different season

Seasons	Bikaner	Hanumangarh	Jaisalmer	Udaipur
Summer	6 (2)	11 (4)	7 (2)	9 (3)
Rainy	12 (5)	5 (2)	5 (1)	4 (1)
Winter	2 (2)	5 (0)	12 (2)	6 (3)
Total	20 (9)	21 (6)	24 (5)	19 (7)

Table-38. Age-wise prevalence of mange infection of camels in different area of Rajasthan

Total number of samples collected	Number of different age groups of camels used for skin scrapping examination/Total number of samples positive for mange infestation			Place of sample collection
	< 1 year	1 -3 years	>3 years	
20	4/1	6/3	10/5	Bikarier
21	5/2	7/3	9/1	Hanumangarh
24	6/2	10/2	8/1	Jaisalmer
19	5/1	8/4	6/2	Udaipur

Table-39. Sex-wise prevalence of mange infection of camels in different area of Rajasthan

Total number of sample collected	Total number of sample collected/positive for manage infection		Place of sample collection
	M	F	
20	7(3)	13(6)	Bikaner
21	9(2)	12(4)	Hanumangarh
24	10(2)	14(3)	Jaisalmer
19	5(4)	14(3)	Udaipur

There was no significant variation of infection pattern in terms of sex of camel. Overall poor conditioned camels appeared to be most susceptible to infection. Overcrowding, poor feeding and general mismanagement appeared to be the main cause of mange among camel as reveled in the present study.Ivermectin along with Levamisole Hydrochloride was injected sub-cutaneously in all suspected animals from which samples collected.

Other diseases: There were few faecal samples of younger camels found to be positive for coccidiosis (Table-40). The young camels suffering from diarrhea stained with blood and mucous were considered for the present study. After microscopic examination of oocyst and amplification of DNA of coccidian oocyst with different primers, two genus of coccidia were identified *i.e. Eimeria* and *Isospora*.

Table-40. Details of faecal samples examination of camel for Coccidia in different areas of Rajasthan

Total number of samples collected	Number of different age groups of camels used for faecal sample examination/Total number of samples positive for coccidia infestation			Place of sample collection
	< 1 year	1-3 years	>3 years	
266	16/1	11/0	239/6	Bikaner
89	0/0	12/0	77/2	Hanumangarh
102	5/1	19/2	78/0	Jaisalmer
106	13/2	19/1	74/0	Udaipur

After microscopic examination of oocyst and amplification of DNA of coccidian oocyst with different primers, two genus of coccidia were identified i.e. *Eimeria* and *Isospora*. Besides a number of genes of *Trypanosoma evansi* and Tick vector have been identified, cloned and sequenced. These are:

a) Actin Gene of *Trypanosoma evansi* (GQ392135)

b) PFR-2 Gene of *Trypanosoma evansi* (GQ392136)

c) Beta tubulin gene of *Trypanosoma evansi* (GQ483462)

d) Cytochrome oxidase gene of *Hyalomma dromedarii* (GQ483461)

These genes are related to proteins of trypanosomes and tick vector having great significance related to protective potentials in hosts.

c. Sub-project : Epidemiology of viral diseases of camels

Sub-project Leader : G. Nagarajan

Camelpox: Three blood samples and skin scabs were collected from the camels exhibiting the symptoms of camelpox from the place Rughnathpura, Jhunjunu district in the month of November 2009.Partial gene sequence of the haemagglutinin gene of camelpox virus was submitted to the NCBI database for which the assigned Gen Bank accession number is GQ453435. Schlafen-like [protein gene of camelpox virus was amplified and cloned in p GEM-T vector

Contagious ecthyma: A total number of six and one blood samples and skin scabs were collected from the camels exhibiting the symptoms of contagious ecthyma from the places Chawand, Udaipur district (September 2009) and Rughnathpura, Jhunjunu district (in the month of November 2009), respectively. The full length gene sequence of the envelope gene of camel contagious ecthyma virus was submitted to the NCBI database for which the assigned Gen Bank accession number is GQ390365.

VM-10. Project: Evaluation and validation of ethno veterinary medicine/ practices against camel diseases

Project Leader : F. C. Tuteja

Associate : Sanjay Kumar

Ethno-veterinary practices used by camel farmers of Bikaner, Jaisalmer, Udaipur and Hanumangarh district of Rajasthan and other farmers visiting camel fares were collected. A total of 15 resource persons prescribing such practices at village levels were also contacted. These practices are summarized (Table-41-43).

Table-41. Traditional drugs/plants used by camel owners for the treatment of skin disorders

S. N.	Ailment	English/Scientific name of the drug/ plant	Local name of the drug/plant	Dose (average) and mode of use
1.	Nasal wounds	Alum	Fitkari	Grinded, Q.S. Topical
		Phenyl and water	Phenyl aur panee	1:5, Q.S. Topical
		Coal from root of Capparis deciduas	Karir ki jar ka koyla	Grinded, Q.S. Topical
2	Saddle gall	Leather ash mixed with Butter fat India	Chamrae ki rakh aur ghee	1:1, Q.S. Topical
		Mustard (*Brassica* spp.) oil and candle wax	Sarson ka tael aur mombati	1:1, warm, Q.S. Topical
3	Udder lesions	Henna (*Lawsonia inermis*) mixed with water	Mehandi aur panee	Paste, Q.S. Topical
4	Naval infection	Sulphur in mustard (*Brassica* spp.) oil	Gandhak aur sarson ka tael	1:5, Q.S. Topical
5	Mange	a. Mustard oil (*Brassica* spp) and	a. Sarson ka tael aur	a. Q.S. Topical and
		b. Paste of Garlic (*Allium sativum*)	b. Lahsoon ki chattni	b. 500 g, os weekly thrice
		Sump oil	Kala tael	Q.S. Topical
		Karanj *(Pongamia pinnata)* oil	Karanji ka tael	Q.S. Topical
		Sulphur and Karanj *(Pongamia pinnata)* oil	Gandhak aur karanji ka tael	1:5, Q.S. Topical
6	Thikria	*Pearl millet* flour and common salt	Bajari ka atta aur namak	1:1, Remove skin scrap and rub on the lesions
		Any oil (Til, Mustard, Sump)	Tael	Q.S.Topical

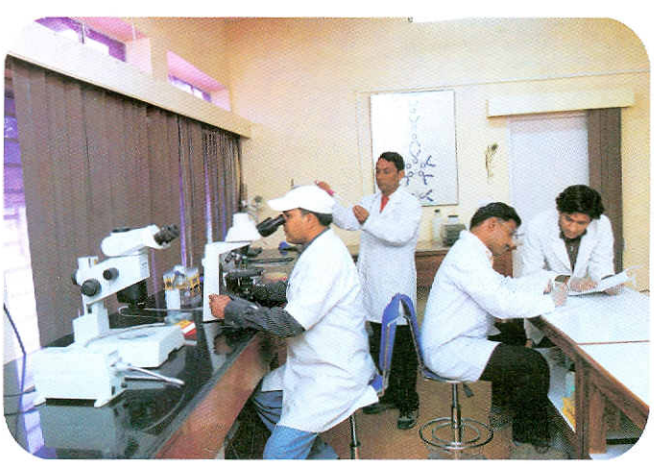
Table-42. Traditional drugs/ plants used by camel owners for the treatment of gastrointestinal disorders

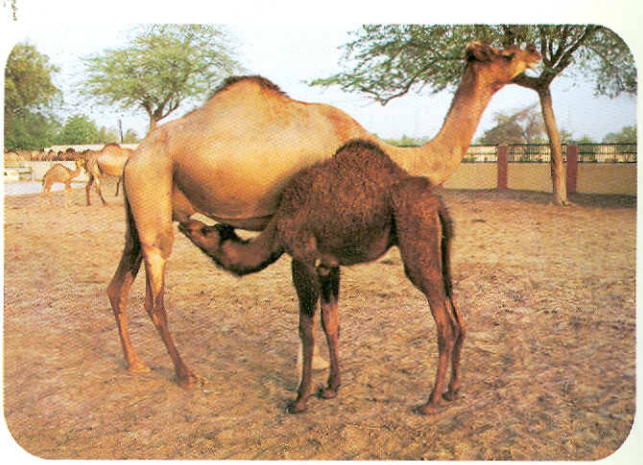
S.N	Ailment	English/Scientific name of the drug/ plant	Local name of the drug/ plant	Dose and mode of use
1	Indigestion	Rock salt	Saindha namak tave par pacca kar.	250 g, roast on iron plate and sock in 1L cold water overnight, os
		Sodium bicarbonate	Meetha soda	100 g in 500 ml water os
		Aloe vera (*Aloe barbadensis*)	Gwarpatha	500 g, paste os
		Decoction of Bitter melon (*Citrulus colocynthis*) root and Rohira (*Tecomela undulata*) root bark.	Tumba ki jar aur rohira ki jar ki chall	500 g each, boiled in 2 L water os
		Bitter melon (*Citrulus colocynthis*) and common salt	Tumba aur namak	250 g each, ground os
2	Impaction	Decoction of *Solanum surattense* fruit, Omum (*Trachyspermum ammi*) seed and Rock salt	Ringani, Ajwain aur Saindha namak	100 g,250 g and100 g, respectively, boil in 1 L water and cool os
		Casia acutifolia.	Sonamakhi	250 g, ground os
		Cistanche tubulosa	Bhufod/ Fafod	500 g, ground os
		Leptodenia pyrotechnica	Khimp	1 kg, ground os
		Seed of *Argemone mexicana*	Satyanasi	250 g, ground os
		Seed of *Vernonia anthelmintica*	Kali ziri	100 g, ground os
3.	Colic	Root of fog (*Calligonum polygonoides*)	Fog ki jar	500 g, ground os
		Self made wine from jaggery	Desi daru	1 L, os
4.	Constipation	*Cucumin callosus* fruit, Omum *Trachyspermum ammi*) seed and common salt	Kachari, Ajwain aur namak	500 g, 250 g and 250 g, respectively, ground os
		Castor *(Ricinus communis)* oil	Arandi ka tael	100 ml, os
		Black castor(*Ricinus communis*) seed	Kali arandi	250 g, ground os
5.	Diarrhoea	Flour naturally found near root of *Calligonum polygonoides*	Atta found near fog root	500 g, os
		Prosopis cineraria leaves fried in butter fat India	Khejari loom ghee mein pacca kar	1 kg and 250 g, respectively, os

Table-43. Traditional drugs/ plants used by camel owners for the treatment of miscellaneous disorders

S.N.	Ailment	English/Scientific name of the drug/ plant	Local name of the drug/plant	Dose (average) and mode of use
1	Retention of placenta	Leaves of bamboo (*Bambusa pallida*)	Bans ki patti	500 g, ground os
		Pulses	Daley	2 kg, boiled os
		Cistanche tubulosa	Bhufod/ Fafod	500 g, ground os
		Red *Abrus precatorius with black tip*	Lal chirmi kale muh wali	2 seed, os
2	De-wormer	Leaves of neem *(Azadirachta indica)*	Neem ki patti	1 kg, os
		Copper Sulphate and Tobacco	Neela thotha aur tambaku	10 g and 100 g, respectively, ground os
		Seeds of *Datura metel*	Daturae ke beej	50 g, ground os
3	Nasal discharge Pneumonia	Decoction of root of Babool *(Leucaena leucocephala)*	Kiker ki jar ubal kar	2 kg boiled in 5 L water
		Ginger (*Zingiber officinale*), Clove (*Syzygium aromaticum)*	Sonth aur laung	250 g and10 g, respectively, ground os
4	Allergic Reaction	Whole plant of *Colocasia esculenta*	Amla bela	500 g, paste os
5.	Rheumatic problems	Ginger (*Zingiber officinale*)	Dry ginger/Sonth	250 g, ground os
		Seeds of *Piper longum.*	Pipli	100 g, ground os
6.	Weakness	Red alum, Jaggery and mustard (*Brassica* spp) oil	Lal fitkari, Gur aur Sarson Ka tael	100g, 1kg and 1kg, respectively. Boil and cool os
7	Kumree	Pulv. Nuxvomica	Kuchla churra	10 g, os daily for 3 days

1. Firing being practised on an animal which is not responding to any kind of treatment, so firing remains the last resort.
2. Some of the ethno-veterinary practices are justified either by scientific experimentation and or pharmacological activity of the active constituents present in the plant/medicine..





VM-5. Project :Therapeutic spectrum of selected herbs against dermatophytes/ bacteria

Project Leader : F. C. Tuteja

Associate : D. Suchitra Sena

Invitro antibacterial and antifungal activities of few native plants was tested against skin isolates of camels.

Source of herbs: Traditional medicinal herbs viz Ashwagandha (*Withania somnifera*). Datura (*Datura metel*), Peepal (*Ficus religiosa*). Pardesi Kiker (*Prosopis juliflora*), Anar (*Punica granatum*), Tulsi (*Ocimum sanctum*) leaves were collected locally. Garlic (*Allium sativum*) bulb and Aloevera (*Aloe barbedensis*) were procured from the local market.

Methanol extraction: All herbs were either cut into small pieces or dried under a shade and were coarse grounded. Five grams of the coarse powder were mixed with 100 ml of methanol in glass stoppered bottles which were kept over night at room temperature. The following day, these mixtures were vortexed for 10 minutes and then centrifuged at 3000 rpm for 10 minutes. The resulting supernatant of each herb was collected separately in glass beakers and chilled in a freezer for 2 hours. Thereafter the liquid portion was poured into a clean separate beaker and the methanol evaporated at 37-40 °C. The final volume was reconstituted to 5 ml with normal saline and was stored in refrigerator till further use.

Antibacterial activity: A total of 27 bacterial isolates from camel skin infections, which comprised of *Staph aureus* (16), *Corynebacterium spp.* (9) and Pseudomonas *spp.* (2) were taken to investigate antibacterial activity. For conducting antibacterial sensitivity test, 2-3 pure single colonies of fresh cultures were suspended in 3 ml of sterilized nutrient broth and were incubated at 37°C for appearance of turbidity. These cultures were then spread over nutrient agar plates with cotton swabs under sterilized conditions. For each culture, separate plates were used and these plates were divided into eight parts. The parts are marked as: T- Tulsi, W- Ashwagandha, D- Datura. P- Peepal, A- Anar, K- kiker, G- Garlic and Al- Alo vera. A well was punched into the centre of each part, and 10µl of methanol extract was pipetted into the wells. Plates were kept at room temp for one hour to facilitate diffusion and were then incubated at 37°C for 24 hours. The inhibition diameter was measured Results were interpreted as positive when the diameter of the inhibition zone was more than 10 mm (Table-44).

Antifungal activity: A total of 22 fungal isolates from camel skin infections, which comprised of Microsporum spp. (6), *Yeast type culture,u.c.* (9), *Scopulariopsis brevicaulis* (4), *Rhizopus spp.*(2) and *Penicillium spp.*(1) were taken to investigate antifungal activity. For conducting antifungal sensitivity tests pure cultures were suspended in 3 ml of Sabourauds dextrose broth and were incubated at 30°C for 24 to 48 hours for appearance of turbidity. These cultures were then spread over antimycotic sensitivity test agar plates with cotton swabs under sterilized conditions. For each culture, separate plates were used and these plates were divided into eight parts. The parts are marked as: T= tulsi, W- ashwagandha, D- datura. P- Peepal, A- anar, K- kiker, G- garlic and Al-Alovera. Into the centre of each part, a well was punched and10l of methanol extract was pipetted into the wells. Plates were kept at room temp for one hour to facilitate diffusion and were then incubated at 30°C for 24-96 hours. The inhibition diameter was measured. Results were interpreted as positive when the diameter of the inhibition zone was more than 10 mm.

Table-44. Antibacterial sensitivity of methanol extract of medicinal herbs

Bacterial isolates	No of isolates found sensitive								
	Number of isolates	*Withania somnifera*	*Datura metel*	*Ficus religiosa*	*Prosopis juliflora*	*Punica granatum*	*Ocimum sanctum*	*Allium sativum*	*Aloe barbedensis*
Staphylococcus aureus	16	16	15	0	16	16	1	-	1
Corynebacterium spp	9	9	9	0	9	9	1	1	-
Pseudomonas spp	2	-	-	0	2	2	-	-	-
Total isolates found sensitive	27	25	24	0	27	27	2	1	1
Percentage of the isolates found sensitive		92.59	88.88	0	100	100	7.4	3.7	3.7

BT-AS-1.Project :Molecular cloning and characterization of cameline cytokine gene (s)

Project Leader : G. Nagarajan

Associates : S. K. Ghorui, K. M. L. Pathak

Venous blood with anticoagulant in aseptic conditions from healthy camels using vacutainers was collected. Isolation of peripheral blood mononuclear cells (PBMCs) by density-gradient centrifugation was carried out by using Histopaque. Culturing of PBMCs in RPMI medium and stimulation of PBMCs by Concanavalin A was standardized .Total RNA isolation from stimulated cells using Trizol reagent and RT-PCR for IL-2,IL-4, IL-6, IFN- Gamma and TNF-α was successfully carried out. Cloning of all the above said amplified gene fragments was done in p GEM-T Easy vector and confirmation of the respective recombinants was done by restriction enzyme digestion using EcoR I (Fig.47). Sequencing reactions for the same were done at Delhi University-South campus. Subsequently, the nucleotide sequences were submitted to the NCBI database. The details of the gene sequences and their corresponding GenBank accession numbers are given below.

S. N.	Name of the Gene	GenBank Accession Number
1.	Camel IL-2 gene	HM051105
2.	Camel IL-4 gene	HM051106
3.	Camel IL-6 gene	HM051107
4	Camel IFN-Gamma gene	HM051108
5	Camel TNF-alpha gene	HM051109

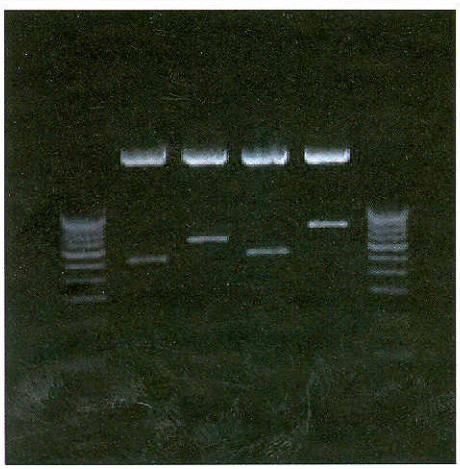


Fig-47. Cloning of Cytokine genes

M-Marker

1- IL2- 481 bp

2- IL6 – 636 bp

3- IFNgamma-501 bp

4- TNF alpha-745 bp

Project: Bio-prospecting of genes and allele mining for abiotic stress tolerance

Project Leader : G. Nagarajan

Associate : Sanjay Kumar

Data on biochemical, physiological and haematological parameters of dromedaries at different weather conditions are being recorded. Amplification of HSP70 gene of *Camelus dromedaries* was attempted.

BT-AS-3.Project :Development of cell culture adapted live attenuated camelpox Vaccine

Project Leader : V. Bhanuprakash

Associates : G. Venkatesan, K. M. L. Pathak and G. Nagarajan

The identity of the virus used for vaccine development was confirmed as camelpox based on cytopathic effect in Vero cells, neutralization, genus and specific PCRs and cloning and sequencing of B5R (envelope protein) as described above. The virus produced characteristic CPE and the CPE initiated as early as 24 post infection and completed by 48-72 hrs post infection. The passage was continued in Vero cell up to passage 50. At P50, the virus was titrated and the tire was found to be $10^{6.82}$/ml. The virus was freeze-dried using lactalbumin hydrolysate (LAH, 2.5%) and sucrose (5 %) prepared in Hank's balanced salt solution (HBSS).

The vaccine was checked for its sterility and it was found free from bacteria (aerobic/anaerobic), mycoplasma and fungal contaminants. Then, the vaccine was tested for its innocuity in G pigs and mice. All the animals remained normal during the observation period of 14 days and none died. Thus, the vaccine found innocuous in laboratory animals.

All the camel calves (n= 6) including in-contact animals were observed for clinical response and recorded during the following 14 days. The vaccinated animals showed no local or systemic reaction other than

a delayed-type hypersensitivity reaction in the form of "take", which disappeared within 4-5 days post vaccination. Serum samples were collected at different intervals and were examined for sero-conversion. Study showed that the experimental vaccine found safe in camels and safety ranged from $10^{3.0}$ to $10^{5.84}$ $TCID_{50}$ (Tissue Culture Infective Dose). It produced no adverse reaction even at high dose ($10^{5.84}$ $TCID_{50}$). The "takes" of peanut size (1.7 to 2.0 cm) appeared on day 4th day vaccination disappeared by 8th day post vaccination (dpv). A raise of 1-1.5° F temperature was noticed in vaccinated animals, whereas control animal remained normal throughout the study. Following administration of vaccine, camel calves react initially through a way of formation of local hyperemia at the site of inoculation indirectly implying the viability of the virus, like in other pox viral vaccines . Marginal rise in temperature in case of camel calves for 4-8 days post vaccination was generally transient that subside gradually (Fig.-48).

Shedding or horizontal transmission of the vaccine virus from the immunized animals to in-contact animals was not observed under experimental conditions. In the group maintained in close contact with the vaccinated camels, no thermal response and no rise in antibody response have been evidenced, suggesting that the vaccine virus is not secreted following immunization. The vaccinated animals remain healthy with a transient raise in temperature (Fig- 48). Further, the vaccinated and in contact camels were periodically bled at 0, 7, 14, 23 and 27th day post vaccination for sero conversion employing serum neutralization test. All the vaccinated animals were negative for camel pox virus antibodies from day 7th to 14th dpv. While on day 23rd dpv, all the vaccinated animals showed a titre range of 1:2 to 1:4. On day 27th dpv, the titre in all the vaccinated animals was found to be 1:4. This shows that the vaccine virus was immunogenic and can mount immune response.

Table- 45. Details of animal groups used in the potency trial of CMLV vaccine

S.N.	Group	Number of Animals	Vaccine Dose	Challenge
1.	I	6	1 dose = 10^{3} $TCID_{50}$	On 28th dpv
2.	II	6	100 dose = 10^{5} $TCID_{50}$	On 28th dpv
3.	III (In contact control)	3	Sterile PBS	On 28th dpv

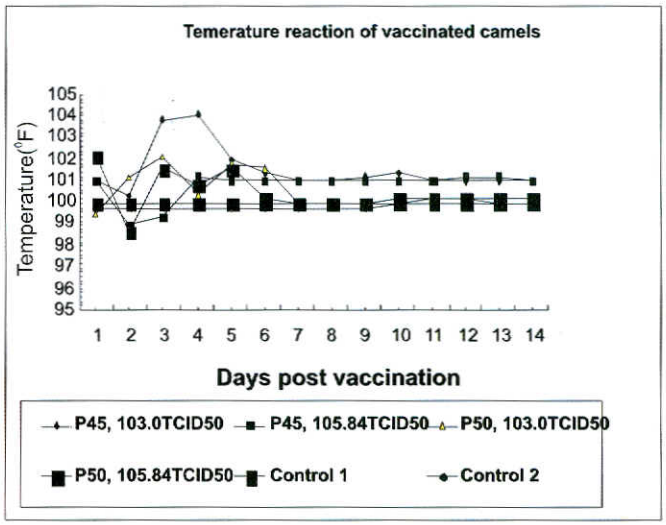


Fig-48. Temperature reaction of vaccinated camels (safety)

A total of 25 sera from healthy camels were collected from NRCC, Bikaner and screened for the presence of camelpox virus (CMLV) specific antibodies using serum neutralization test (SNT) as described earlier so as to conduct potency testing of the vaccine. Out of 25 animals screened for absence of CMLV specific antibodies, only 15 animals (n=15) have been selected for potency study of the vaccine. Details of the study indicating various groups used in this study are shown in Table- 45. Initially, all the groups of camels were received CMLV vaccine except control which only inoculated with PBS and in contact camel calves were maintained in a separate camel herd at National Research Centre on Camel, Bikaner. The vaccinated and control camel calves were kept isolated from other animals. All vaccinated and control animals were observed daily for the development of 'takes' and rise in body temperature up to 21 days. Majority of the animals developed "takes" at the site of inoculation except the controls indicating non-shedding of the vaccine virus from the vaccinates and lack of horizontal transmission. On 28th day post-vaccination, each group of animals received $10^{6.1}$ TCID50/ml of virulent virus (CMLV-2, in 0.5 ml) intra-dermally at two sites on the abaxial surface of caudal fold as a challenge virus. Then, challenged animals were observed daily for clinical parameters namely thermal response and erythematous skin lesions. Sera samples were collected from all the animals at 7th, 14th, 21st and 28th day post vaccination and also 10th, 14th and 21st day post challenge for sero-monitoring of animals. Both the

groups, which received 1 dose and 100 doses, did not manifest any severe skin lesions after challenge with virulent virus. But, the control group that received only PBS showed reddening, swelling and erythematous —skin lesions at the site of challenge (Fig.- 49). Further, control group showed a drastic rise in body temperature at 4-8th day post-challenge which was not observed in —vaccinated animals (Fig.-50). When the sera samples were screened for the presence of CMLV specific antibodies using serum neutralization test (SNT), vaccinated animals had shown gradual rise in SNT titre up to 21st day post vaccination and a drastic rise in serum antibody titres after challenging with virulent virus. This sero-conversion was not observed with control animals, which had shown slight change in antibody titre at 10th day post challenge (Fig-51).

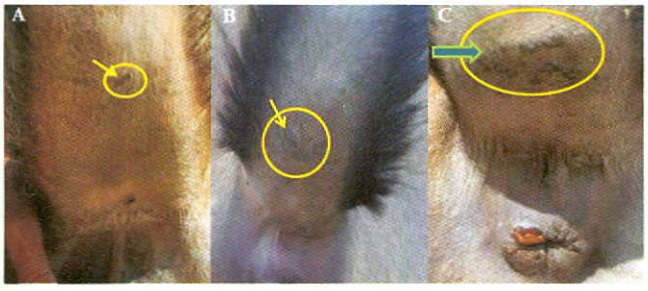


Fig-49. Clinical observation of all groups of animals at 10 days post challenge (A) Group I/1dose (B) Group II/100 doses (C) Control group

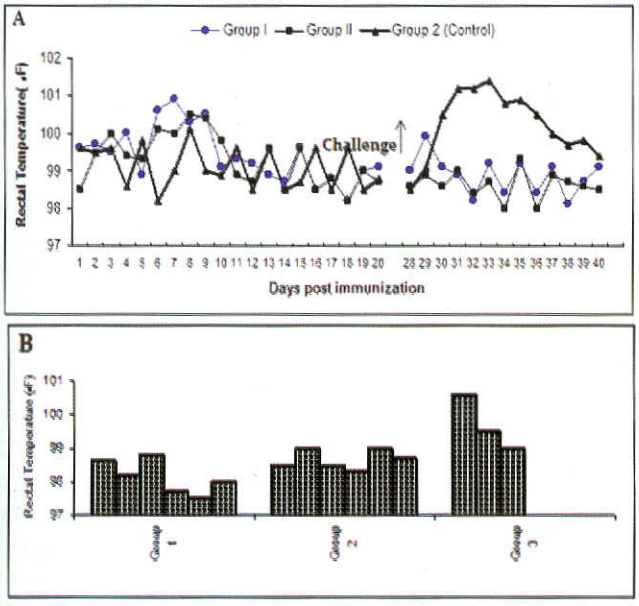


Fig-50.Clinical observation of animals during potency study (A) Thermal response of post-vaccinated and challenged animals, (B) Rectal temperature of individual animals in each group at 10 days post challenge

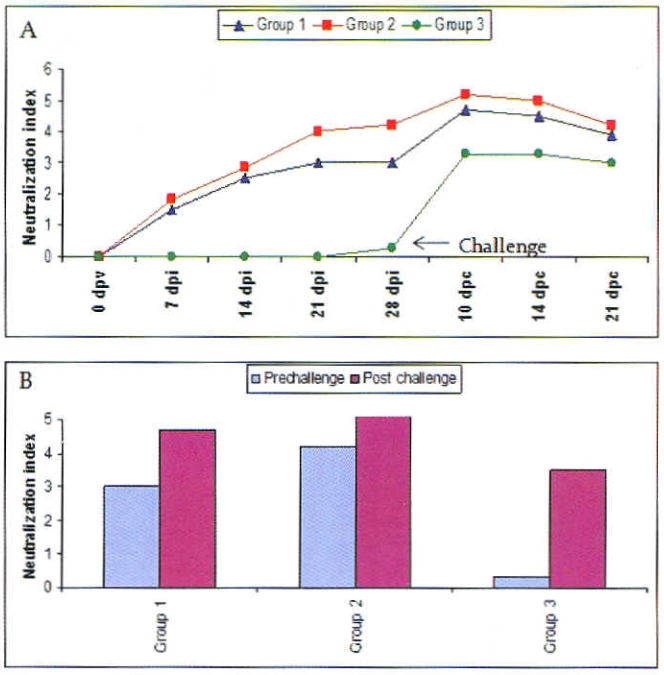


Fig-51.Sero-monitoring of post-immunized and challenged animals by SNT (A) Immune response of vaccinated and control group of animals during post vaccination and challenge (B) comparison of all groups between pre- and post-challenge status

VP-2.Project: Management of gastro-intestinal parasites in camel herd and molecular characterization of anthelmintic resistant strains of parasites

Project Leader : Sanjay Kumar

Associates : S. K. Ghorui and G. Nagarajan

Prevalence of G.I. Parasites in camels from different areas of Rajasthan during different seasons are depicted in the tables (46-50) given below.

Table-46. Infection rate of G. I. parasites in camels during summer season

Age-group	Bikaner	Hanumangarh	Jaisalmer	Udaipur
d" 1 Year	16 (2=12.5%)	0 (0=0%)	5 (0=0%)	13 (0=0%)
1 – 3 Year	11 (2=18.18%)	12 (4=33.33%)	19 (0=0%)	19 (1=5.26%)
> 3 Year	239 (24=10.04%)	77 (9=11.7%)	78 (5=6.41%)	74 (4=5.40%)
Total	266 (28=10.5%)	89 (14=15.73%)	102 (5=4.90%)	106 (5=4.72%)

Table-47. Infection rate of G. I. parasites in camels during rainy season

Age-group	Bikaner	Hanumangarh	Jaisalmer	Udaipur
d" 1 Year	9 (2=10.53%)	4 (0=0%)	7 (1=14.29%)	10 (1=10%)
1 – 3 Year	17 (4=23.53%)	13 (6=46.15%)	3 (0=0%)	20 (5=25%)
> 3 Year	111 (15=13.51%)	41 (11=26.82%)	55 (24=43.64%)	45 (8=18.67%)
Total	137 (21=15.33%)	58 (17=29.31%)	65 (25=38.46%)	75 (14=18.67%)

Table-48. Infection rate of G. I. parasites in camels during winter season

Age-group	Bikaner	Hanumangarh	Jaisalmer	Udaipur
d" 1 Year	6 (0=0%)	2 (0=0%)	7 (0=0%)	5 (0=0%)
1 – 3 Year	5 (0=0%)	8 (3=37.5%)	14 (1=7.14%)	18 (1=5.56%)
> 3 Year	19 (4=21%)	38 (7=18.4%)	42 (3=7.14%)	37 (1=2.7%)
Total	30 (4=13.3%)	**48 (6=12.5%)**	63 (4=6.34%)	60 (2=3.3%)

Table-49. Prevalence of G.I. Parasites in camel from NRCC farm during different seasons

Age-group	Summer season	Rainy season	Winter season
d" 1 Year	13 (0=0%)	16 (0=0%)	29 (0=0%)
1 – 3 Year	6 (3=50%)	4 (0=0%)	34 (0=0%)
> 3 Year	57 (14=24.56%)	46 (16=34.78%)	112 (15=13.39%)
Total	76 (17=22.37%)	66 (16=24.24%)	175 (15=8.75%)

Table-50. Climatological characterization of different districts of Rajasthan

Period	Bikaner	Jaisalmer	Udaipur
March June,2009	T_{max} - 39.27 °C T_{min} - 25.05 °C **Hot-Dry** (High temp., Low Humidity and Low Rainfall)	T_{max} – 39.38 °C T_{min} - 24.25 °C TRF – 8.75 mm RH – 51.75% **Hot-Dry** (High temp., Low Humidity and Scanty Rainfall)	T_{max} – 38.02 °C T_{min} - 22.95 °C TRF – 31.17 mm RH – 43.25% **Hot-Dry** (High temp., Low Humidity and Low Rainfall)
July, Oct.,2009	T_{max} – 38.35 °C T_{min} - 26.17 °C TRF – 47.15 mm RH – 56.5% **Hot-Dry** (High temp., Moderate Humidity and Moderate Rainfall)	T_{max} – 38.02 °C T_{min} - 25.23 °C TRF – 9.7 mm RH – 67.75% **Hot-Dry** (High temp., Moderate Humidity and Low Rainfall)	T_{max} – 32.9 °C T_{min} - 22.57 °C TRF – 138.1 mm RH – 72% **Hot-Dry** (High temp., High Humidity and High Rainfall)
Nov.,2009-Feb. 2010	T_{max} – 26.8 °C T_{min} - 11.67 °C TRF – 3.02 mm RH – 55.75% **Cold-Humid** (Low temp., Moderate Humidity and Scanty Rainfall)	T_{max} – 27.02 °C T_{min} - 12.4 °C TRF – 0.9 mm RH – 56.5% **Cold-Humid** (Low temp., Moderate Humidity and Scanty Rainfall)	T_{max} – 27.63 °C T_{min} - 11.12 °C TRF – 2.4 mm RH – 65.5% **Cold-Humid** (Low temp., High Humidity and Scanty Rainfall)

- Climatological informations were correlated with the prevalence of G.I. Parasites of camel and bioclimatographs have been made.
- EPG have been substantially reduced following administrations of anthelmintics –Fenbendazole at Udaipur and Hanumangarh, Albendazole at Bikaner & Jaisalmer and Morantel at NRCC farm.
- *Haemonchus, Strongyloides & Nematodirus* spp. larvae were collected after copro-culture of positive faecal samples (Fig. 52-54).
- Pasture was collected from camel grazing area from all the four districts. After pasture larval count, *Haemonchus* larvae were detected from the pasture of Jaisalmer district only.

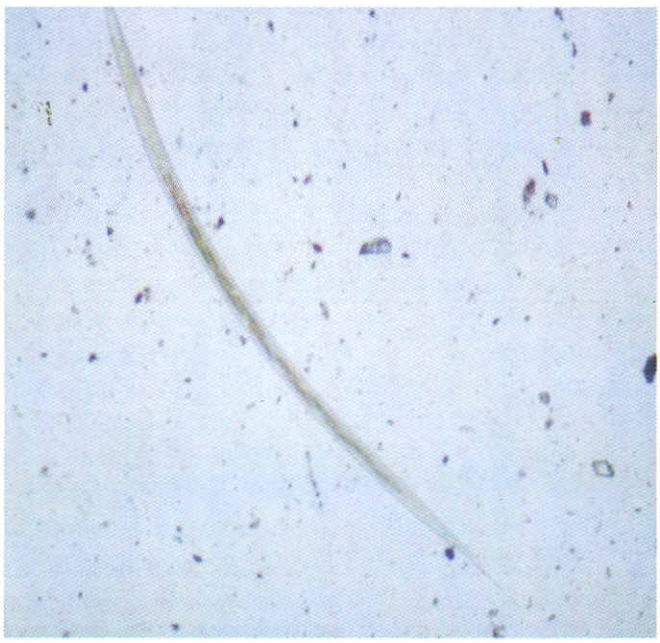


Fig- 52. Larvae of *Haemonchus sp.*

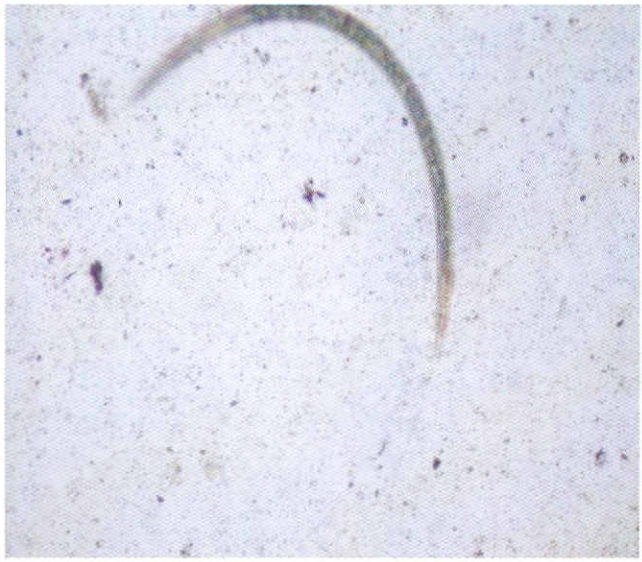


Fig-53. Larvae of Nematodirus sp.

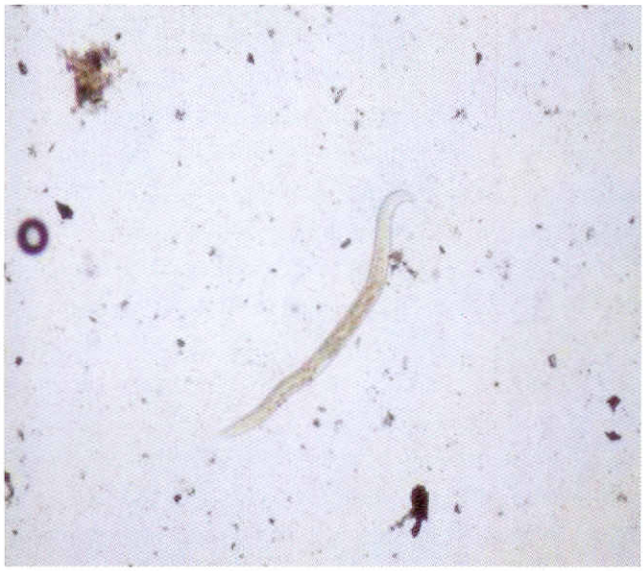


Fig-54. Larvae of *Strongyloides sp.*

BT-AS-2. Project : Development of single domain antibodies for the diagnosis / therapy – an inter institutional project (BARC, Mumbai)

Project Leader : K.M.L.Pathak and Y. Venugopal

Associates : S. K. Ghorui and G. Nagarajan

Presence of functional Immunoglobulins devoid of light chain, known as heavy-chain antibodies in camel were reported during the late 1990s. The variable region of these heavy-chain antibodies are known as V_HH. The V_HH offers certain advantages over the conventional four-chain antibodies, because of their small size and better solubility. Thyroglobulin (Tg) is used as a diagnostic marker for thyroid cancer. Anti thyroid V_HH antibodies obtained from camel can be used for immunoscintigraphy. For this purpose two camels) were immunized (at National Research Centre on Camel) with human thyroglobulin (hTg). After initial priming and repeated boosters, blood was collected from the jugular vein on the seventh day following booster. The presence of antibodies in the camel-serum against hTg was confirmed by antibody titre. PBMNCs were collected from the 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 V_HH and CH_2 domain of camel γ immunoglobulin using a pair of primers (CH2FORTA4 and VHBACKA6). While this work was in progress, a Tg-IRMA assay was set up using the polyclonal Tg antiserum drawn from the same camel. The antibody titre was 35% B_0/T at a dilution of 1:25,000 and the affinity of the antibody is about $4x10^{10}$ Liters/Mole in liquid phase Radioimmunoassay system. The antibody produced was used for developing a both RIA (Radioimmunoassay) as well as IRMA (Immuno Radio Metric Assay) These assays correlates well with the routine assays. The linear regression line data of the two assays developed are as follows –

Y(camel Tg-IRMA) = 0.759 * in-house RIA – 3.2, [r=0.90n=140, p<0.001].

The sensitivity of the assay developed is about 1ng/mL. The Tg-IRMA developed was compared with a commercial Tg IRMA kit from Izotop, Hungary which is being used routinely in our lab.

Y(camel Tg-IRMA) = 0.886 * Izotop IRMA – 1.67 [r=0.80, n=140, p<0.001]

In the near future we will prepare a cDNA Library of camel immunoglobulin using the defined antigen sensitized PBMNCs.

Unit: Camel Nutrition

AN-4.Project :Development of complete feed blocks for male breeding camels

Project Leader: A. K. Nagpal

Associates : U. K. Bissa and N. Sharma

Eight healthy male breeding camels of Bikaneri and Jaisalmeri breeds of 10-14 years of age and 778.88 ± 36.11 kg body weight were randomally allotted to 2 groups of 4 each and were offered feed blocks prepared containing either bajra (Group B) or jaggery plus groundnut oil (Group O). A digestibility trial for a period of 5 days was conducted in April 2009. The quantity of feed offered, refusal and faeces voided were recorded daily. The representative samples of feeds and faeces were pooled daily and analyzed for proximate principles. The serum samples were analyzed for concentrations of metabolites using Ark diagnostic kits to assess the metabolic profile of the animals. Data obtained were subjected to statistical analysis.

Daily feed intake declined more in group B than in Group O male camels during the experimental period (Table- 51). In case of group B, daily DM intake was 7.4 kg in Dec.2008, became lowest of 4.1 kg in Feb.2009 and rose again to 8.8 kg in May, 2009. In case of group O daily feed intake was 8.5 kg in Dec. 2008, it became lowest at 5.2 kg in March, and rose to 9.5 kg in May 2009. Overall average daily dry matter intake was 5.93 ± 0.59 kg and lower in Group B as compared to 7.03 ± 0.29 kg in group O camels. The average total feed intake per camel during the 150 days of feeding trial was 18.56 % higher in group O (1172.08 kg) than in group B animals (988.58 kg). Decline in feed intake was accompanied by decline in body weight of both the groups of male camels which was 85.75 kg and higher in group B group than 46.0 kg in group O animals. The body weight declined from 781.25 on Dec. 2008 to 653.75 in March, 2009 and rose again to 695.5 kg in May 2009 in group B animals. In case of group O, the body weight declined from 776 kg in December 2008 to 676 kg on 31.03.2009 and rose to 730.0 kg on 09.05.2009. Body weight loss or gain is a directly related with protein and energy intake. The lower nutrient intake by breeding male camels resulted in body weight loss, hence, higher supplementation is required to maintain the body weights of camels.

The calculated cost of ration was Rs.365.66 and 527.32 per kg respectively for group B and O respectively and total cost of 150 days feeding worked out to be Rs. 6180.72 in group O, 71% higher than cost of feeding group B camels (Rs.3614.91) due to high cost of ground nut oil. Thus group B diet was more cheaper and economical but at the cost of poor growth of the animal. The chemical composition of the two diets given to breeding camels (Table- 52) were almost similar.

The digestibility trial data of May, 2009 showed non- significant variation in dry matter (DM) and water intake between two groups (Table- 53). Mean DM intake of 8.99 ± 0.91 kg/d or 1.29 ± 0.11 /100 kg body weight in group B was non-significantly lower than corresponding values of 9.89 ± 0.54 or 1.40 ± 0.09 kg/100 in group O. Water intake of 5.76 ± 0.53 litre/ kg DM in group B was apparently similar to 5.44 ± 0.42 litre water intake/ kg DM in group O camels. The DM digestibility % (75.86 ± 0.76) in group B was also similar to that of group O (72.00 ± 2.78). No significant difference in respect of OM, CP, EE, CF, NFE digestibility and nutrient intake of DM, DCP and TDN g/ kg $W^{0.75}$ was observed between the two groups. Similar digestibility values of proximate principles and nutritional value of diets resulted in statistical similar nutrient intake/ kg metabolic body weight. Water is essentially required for feed digestion and is an important medium for all the metabolic systems of respiration, excretion, blood circulation etc., in the body and its intake is directly related with feed intake and environmental temperature. Water intake was less in male camels fed only moth fodder as compared to those given feed blocks during December. However water intake increased in May with the rise in environmental temperature.

Serum profile revealed significant ($P<0.01$) higher values of GPT, triglycerides and phosphorus in group O than in group B and no significant difference was seen for serum biochemical values of GOT, glucose, total protein, albumin, cholesterol, urea, calcium, chloride (Table- 54). The variations in serum values are within normal range and may be attributed to different dietary energy levels, rutting intensity and date of sample collection. The rutting intensity changes with the weather, it increases with decrease in environmental temperature and then decreases with rise in

environmental temperature.

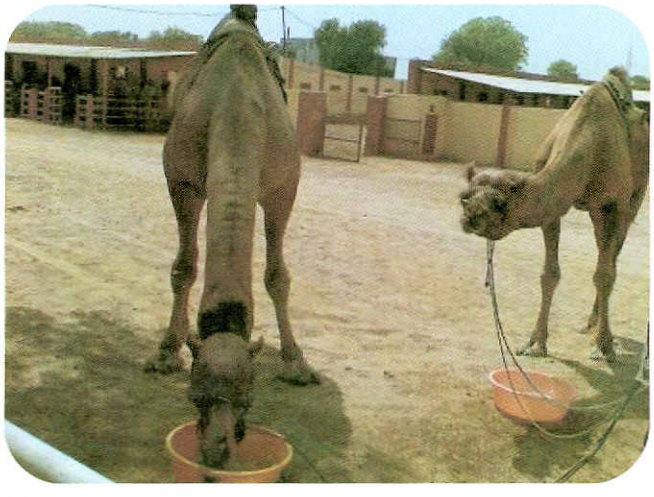
The present study suggested better feed, less body weight loss nutrient intake and in camels given feed blocks containing groundnut oil and jaggery diet but feed cost of group O was Rs. 527/q and 71% higher that that of group B (Rs366/q). Therefore a suitable feeding strategy with feed blocks containing cheaper feed ingredients is desirable which depends upon the rutting intensity of camels.

Table- 51. Variations in the body weights and feed intake of male breeding camels with time

Parameter	Group B	Group O
No. of camels	4	4
DM intake kg/d		
Dec.08	7.4	8.5
Jan.09	4.6	7.2
Feb.09	4.1	6.0
March,09	5.1	5.2
April,09	7.9	7.9
May,09	8.8	9.5
Mean	5.93 ± 0.59	7.03 ± 0.29
Total feed intake kg/150 days	988.58 ± 98.03	1172.08 ± 47.92
Feed cost Rs./q	365.66	527.32
Total feed cost (Rs.)	3614.91	6180.72
Body weight (kg)		
11.12.08	781.25±48.45	776.5±61.10
30.12.08	735.75±25.27	743.25±55.54
0.4.02.09	670.5±18.73	706.25±50.15
02.03.09	653.75±17.77	693.25±49.29
31.03.09	660.75±38.85	676.00±43.31
01.05.09	694.50±34.76	713.75+48.85
09.05.09	695.50 ± 41.72	730.00 ± 45.60

Table- 52. Chemical composition of experimental diets on DM (%) basis

Parameters	CP	EE	CF	Total ash	NFE
Guar phalgati	7.42	0.83	21.44	9.3	61.01
Groundnut haulms	8.25	2.49	20.03	11.19	58.04
Group B	10.2	2.27	25.73	9.74	52.06
Group O	10.11	2.61	24.76	10.28	52.24



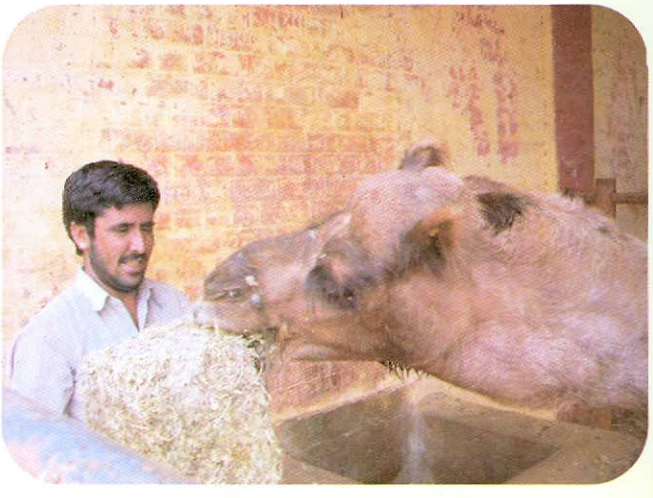


Table-53. Feed intake, digestibility and plane of nutrition of breeding camels

Particulars	Group B	Group O
Body wt. Kg	694.50±34.76	713.75±48.85
DMI kg/d	8.99±0.91	9.89±0.54
DMI kg/100 kg B.Wt.	1.29±0.11	1.40±0.09
Water intake l/d	48.73±2.00	53.50±3.54
Water intake l/ kg DMI	5.57±0.53	5.44±0.42
Digestibility%		
DM	75.86±0.76	72.00±2.78
OM	81.09±0.44	78.84±2.06
CP	77.56±0.73	72.70±2.61
EE	80.51±1.11	74.56±2.20
CF	68.94±1.34	67.38±3.56
NFE	87.46±1.26	82.96±2.03
Nutritive value		
DCP %	7.91	7.35
TDN %	75.29	71.75
ME MJ /kg	11.34	10.81
Plane of Nutrition		
CPI g/d	0.917±0.09	1.000±0.05
DCPI g/d	0.710±0.07	0.724±0.03
TDNI kg/d	6.764±0.67	7.076±0.33
MEI MJ/d	101.89±10.08	106.58±4.97
DMI g/kg $W^{0.75}$	66.38±5.59	72.01±3.80
DCPI g/kg $W^{0.75}$	5.24±0.41	5.27±0.18
TDNI g/kg $W^{0.75}$	49.95±4.14	51.42±1.28
MEI MJ / kg $W^{0.75}$	0.75±0.06	0.77±0.02

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

Table-54. Serum biochemical profile of male breeding camels

Parameter	Group B	Group O
GPT** (U/L)	5.85 ± 0.31	7.33 ± 0.06
GOT (U/L)	74.67 ±5.27	75.57 ± 2.42
Glucose mg (%)	89.59 ±1.35	93.81 ± 3.52
Total protein (g%)	6.45 ±0.27	6.38 ± 0.05
Albumin g %	3.70 ±0.14	3.89 ± 0.11
Triglycerides * (mg %)	12.16 ± 0.14	17.04 ± 1.51
Cholesterol (mg %)	33.88 ± 1.67	36.35 ± 4.28
Urea mg (%)	38.21 ± 1.67	37.10 ± 3.72
Ca (mg%)	6.80 ± 0.26	7.03 ± 0.13
P * (mg%)	5.26 ± 0.11	8.14 ± 0.26
Cl (mmol/L)	86.68 ± 0.28	88.04 ± 1.47

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

AN-3. Project: Studies on nutrient requirement and feed resource availability in camel for optimum production

Project Leader : A. K. Nagpal

Associate : A. K. Roy

Sub-project: Nutrient utilization and serum biochemical profile of adult dromedary camels given oat straw alone and in combination with groundnut haulms was studied. Adult male camels (726.00 ± 30.09 kg B.Wt) were fed sole roughage diet of dry chaffed oat (*Avena sativa*) straw (OS) in phase I for 21 days to estimate its nutritional worth followed by feeding of oat straw and groundnut (*Arachis hypogea*) haulms in 1: 1 ratio (OSGNH) for 21 days in second phase to study the impact on nutrient digestibility and intake. In third phase, the camels were switched to sole roughage ration groundnut haulms (GNH). Digestibility trials was conducted on all the at the end of each phase. The pooled samples were analyzed as per AOAC (1990) and data were subjected to statistical analysis.

Oat straw (*Avena sativa*) is a low density, bulky roughage. Inclusion of 30-40% oat straw in the feed block ration resulted in the formation of easily disintegrable feed blocks. Hence, idea of oat straw based feed block was dropped. Oat straw alone and in 50:50 combination with groundnut haulms (*Arachis hypogea*) was given to 5 adult camels in phase I and II. In phase III, adult camels were given only ground nut haulms roughage based ration. Out of the five adult camels two camels had low intake, refused to eat oat straw in phase I, In phase II again 2 camels ate ground nut haulms and left oat straw ,thus , 2 camels had to be excluded from the experiment. Groundnut haulms were soft, palatable and all the 5 camels readily ate it to fulfill their dry matter requirements in phase III. Chemical composition of oat straw and groundnut haulms are presented in Table- 55. Crude protein, ether extract, nitrogen free contents were higher and crude fibre was lower in groundnut haulms than in oat straw. Average

DM intake kg/d was lower in camels fed solely oat straw ration which improved on supplementation in second phase. Dry matter intake increased further in third phase in camels fed only groundnut haulms. Significant differences in digestibility coefficients of proximate principles except ether extract were observed among 3 phases (Table- 56). The digestibility of DM, OM, CP were significantly (P<0.01) higher in Phase II and III than in phase I. The digestibility of CF was found to be significantly (P< 0.01) lower in phase III as compared to other two phases but similar between I and II. The NFE digestibility increased significantly (P<0.01) from phase I to phase III. The nutritional value of rations in terms of CP, DCP, TDN (%), ME (MJ/ kg) and DM given in 3 different phases was lower in phase I and improved from phase II and III on supplementation of nutritional and palatable groundnut haulms.

Because of supplementation of better nutritive valued groundnut haulms, the dry matter intake coupled with higher nutrient digestibility, the nutrient intake of CP, DCP, TDN and ME increased from phase I to phase III. The dry matter intake was near 1.0 kg/100 kg body weight in phase I and above in phase III. Thus, the oat straw as roughage diet alone is not enough to meet the maintenance requirements of the camels. So the camels fed on oat straw should be supplemented with equal quantity of groundnut haulms. The comparison with ICAR (1985) standards gives much higher maintenance requirement of 16.50 kg DM @ 2.2 kg/ 100 kg body weight , 650 g DCP and 7.5 kg TDN for adult camel weighing 750 kg. Analysis of serum biochemical profile of camels given 3 rations revealed non-significant difference for serum glucose, total protein, urea, calcium but significant (P<0.01) difference was observed among 3 phases (Table- 57). Serum albumin, cholesterol and calcium decreased significantly (P<0.01) from phase I to III.

The results indicated that oat straw alone was not palatable enough to provide nutrients for maintenance of adult camels. Therefore oat should be fed in combination with groundnut haulms. But groundnut haulms alone was palatable enough to support the adult camels.

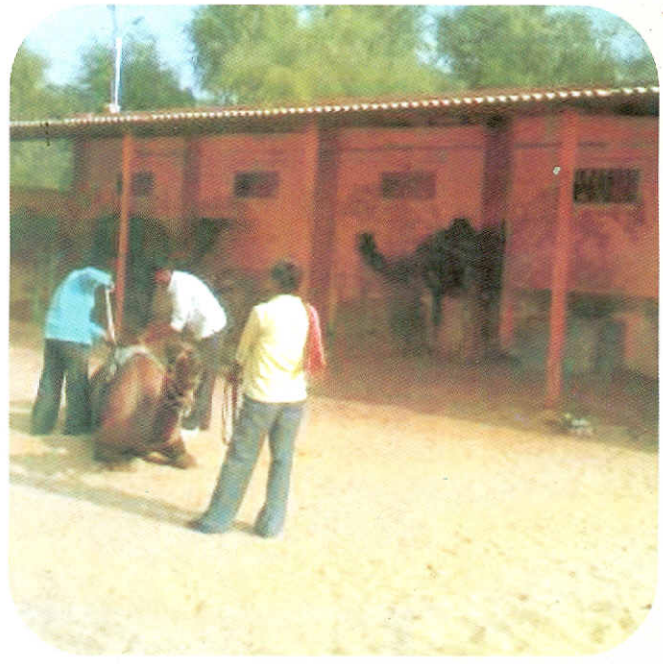


Table-55. Chemical composition of roughages on % DM basis

Dry Fodder	CP	EE	CF	Total Ash	NFE
Oat straw	4.93	1.22	39.93	11.40	42.52
Groundnut haulms	8.75	1.74	28.60	10.75	50.16

Table-56. Nutrient utilization in adult camels fed on 3 roughage based rations

Particulars	OS	OSGNH	GNH
Body wt. Kg	721.00 ± 28.16	757.00 ± 45.83	740.80 ± 53.57
DMI kg/d	3.83 ± 0.28	6.80 ± 0.4	8.70 ± 0.12
DMI** kg/ 100 kg B.Wt.	0.54 ± 0.06	0.98 ± 0.09	1.20 ± 0.09
Digestibility %			
DM**	57.28 ± 1.33	67.76 ± 0.87	65.08 ± 1.15
OM**	59.10 ± 0.77	69.53 ± 1.27	68.49 ± 0.88
CP**	39.13 ± 1.02	62.00 ± 2.70	63.98 ± 1.76
EE	47.39 ± 1.29	55.00 ± 2.83	57.73 ± 4.51
CF**	65.04 ± 0.35	65.89 ± 0.61	56.26 ± 1.49
NFE**	52.05 ± 1.54	68.55 ± 1.53	76.62 ± 0.91
Nutritional value			
CP %	4.93	7.06	8.75
DCP %	1.93	4.37	5.60
TDN %	48.07	60.69	62.38
ME MJ /kg	7.24	9.14	9.40
Plane of Nutrition			
Particulars	OS	OSGNH	GNH
CPI g/d	188.67 ± 14.08	479.67 ± 19.63	761.40 ± 10.66
DCPI g/d	73.67 ± 4.33	298.00 ± 24.02	487.40 ± 17.62
TDNI kg/d	1.84 ± 0.14	4.13 ± 0.29	5.43 ± 0.14
MEI MJ/d	27.70 ± 2.05	62.27 ± 4.42	81.79 ± 2.06
DMI ** g/kg $W^{0.75}$	27.67 ± 2.77	50.22 ± 3.57	62.15 ± 3.54
DCPI** g/kg $W^{0.75}$	0.53 ± 0.05	2.19 ± 0.14	3.48 ± 0.23
TDNI** g/kg $W^{0.75}$	13.30 ± 1.34	30.55 ± 2.66	38.81 ± 2.43
MEI** MJ / kg $W^{0.75}$	0.20 ± 0.02	0.46 ± 0.04	0.58 ± 0.04

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

Table-57. Serum biochemical values of camels fed on 3 roughage based rations

Parameters	OS	OSGNH	GNH
Glucose (mg/dl)	80.12 ± 1.26	87.22 ± 2.16	80.72 ± 2.73
Total protein (g/dl)	6.27 ± 0.27	6.31 ± 0.20	6.81 ± 0.32
Albumin* (g/dl)	3.39 ± 0.19	3.19 ± 0.19	2.91 ± 0.07
Urea (mg/dl)	22.14 ± 1.46	18.94 ± 3.12	17.25 ± 1.19
Cholesterol** (mg/dl)	47.47 ± 1.19	36.76 ± 0.78	25.87 ± 1.56
Ca (mg/dl)	7.89 ± 0.14	7.47 ± 0.14	8.31 ± 0.29
P **(mg/dl)	5.34 ± 0.11	5.14 ± 0.16	2.92 ± 0.22

Project : Network programme on veterinary type culture- rumen microbes

Project Leader : A. K. Nagpal

Associate : D. Suchitra Sena and F. C. Tuteja

The facilities have been created for the isolation, culture and identification of rumen microbes. The isolation work is in progress.

AICRP Project : Improvement of feed resources and nutrient utilization in raising animal production

Project Leader: Nirmala Saini

Associates : S. Vyas, B. D. Kiradoo and D. L. Bohra

Performance evaluation of dromedary camels under different feeding systems at farmer's door-steps: To assess the growth performance of camel calves under grazing and supplementary feeding, an experiment of 120 days was undertaken in Gadwala village in Bikaner. Twenty Bikaneri camel calves of 2 year age were selected. Ten camel calves weighing 299.5±6.93 kg (GR group) were maintained at the owners feeding practice comprised of grazing alone from 7 a.m. to 7 p.m. while other camels weighing 306.5±9.97 kg (SF group) were given ration as per requirements at owner's house. Body weights were recorded every 20 days intervals at the weighing bridge available nearby. The samples of available vegetation from 10 quadrants of a plot measuring 10000 square meters were drawn for the estimation of herbage biomass and availability of nutrients to the animals. (Table-59 and 60)

Table-58. Composition of experimental feeds (g/kg, on DM basis)

Attributes (%)	Feeding systems		
	GR	SF	
Type of ration	Pasture	Ground nut haulms	Concentrate
DM	738.9	955.7	924.8
OM	900.7	869.2	870.2
CP	72.7	77.5	105
NDF	381.5	420.8	211.3
ADF	310.2	307.4	92.0
Hemi-cellulose	97.6	113.4	119.3
Cellulose	224.	201.8	50.0
ADL	158.7	52.0	40.6

Table-59. Compositional analysis of available herbage (% DM)

Feed Samples	DM	NDF	ADF	Hemi Cellulose	Cellulose	Lignin	CP	OM
Pala (*Zizyphus moritiana)*	36.85	45.32	30.12	14.6	17.0	18.7	6.50	84.24
Khejri (*Prosopis cineraria)*	63.31	36.00	28.16	7.84	3.74	11.75	11.75	93.06
Phog (*Calligonium polygonoides)*	68.02	27.80	26.18	1.62	44.90	18.56	7.25	89.25
Kumta	78.31	27.16	20.80	6.36	13.20	14.02	9.75	83.79
Bui*(Aerva tomentosa)*	100.00	64.76	40.68	24.08	28.02	12.28	4.25	87.27
Rohira (*Tecomella undulata*)	89.89	18.42	13.44	4.96	10.86	9.08	11.5	92.85
Israli Babool (*Acacia tortolis)*	72.41	22.16	19.28	2.88	6.00	27.96	6.25	91.58
Kheemp *(Leptadaenia pyrotechnica)*	64.6	52.42	42.02	10.40	44.64	9.10	5.75	92.06
Sinia (*Crotolaria burhia)*	77.94	59.74	49.48	10.26	35.68	17.64	3.75	94.64
Ker (*Capparis decidua)*	87.64	27.80	40.02	14.68	20.70	19.62	6.00	92.01
Average	73.89	38.15	31.02	9.76	22.47	15.87	7.27	90.07

Table-60. Density of dominated and edible trees, bushes and DM availability

Name of the Village	Khejri		Pala		Phog	
	Number/ha	DM (q/ha)	Number/ha	DM (q/ha)	Number/ha	DM (q/ha)
Norangdesar	10	0.41	0	-	36	0.68
Jhanjeo	6	0.24	30	0.67	44	0.33
Semsar	10	0.41	24	0.54	40	0.70
Punrasar	4	0.16	20	0.45	0	-
Bamblu	8	0.32	42	0.94	0	-
Morkhana	0	-	82	1.84	0	-
Average	7.6	0.31	33	4.45	20	0.7

**Sustainability of pasture calculated at 0.21 DM requirement/ head/ha./ yr and 0.76 CP requirement/ head/ha./ yr

Intakes of grazing animals were determined by feeding of Chromium III oxide (Cr_2O_3) as an indigestible indicator for 8 consecutive days. Compositional analysis revealed higher content of cellulose and lignin in the diet of GR than SF group (Table- 58). Dry matter as percent of body weight was found significantly higher in GR group as compared to SF group. Calculated OMD and DMD (%) was observed significantly lower due to more lignin and cellulose contents in GR group and it was also reflected in the faeces of grazing animals with significantly higher contents of DM, NDF, ADF and lignin. (Table-61 and 62)

Table-61. Nutrient intake and digestibility by GR and SF calves

Parameters	Feeding systems	
	GR	SF
Mean b. wt. (kg)**	299.7±6.32	356.0±12.04
Nutrient intake		
Dry matter (kg/d)	6.36±0.81	8.71±0.61
DMI (% body weight)*	2.10±0.15	1.76±0.12
OMI (kg/d)	5.67±0.67	7.37±0.56
OMI (W^{kg})	78.40±6.08	84.44±6.67
DCP (kg/d)	0.195±0.002	0.306±0.041
MEI (MJ/d)	88.32±11.98	115.29±8.78
Nutrient digestibility (%)	GR	SF
DMD*	31.89±1.73	59.28±3.59
OMD*	43.09±1.57	69.34±2.47
CPD	42.16±2.22	48.91±5.87

* denote respectively for P<0.05 and ** for P<0.01
GR – Grazing, SF- Stall fed

Table-62. Composition of faeces of experimental groups

Parameters (% value)	Feeding systems	
	GR	SF
DM**	50.86±1.28	36.35±2.05
OM**	75±1.03	64.10±1.50
Protein **	6.94±0.24	8.45±0.16
NDF**	67.43±1.06	55.79±1.07
ADF**	53.86±0.91	41.89±2.30
Hemicellulose	13.56±0.92	13.89±2.30
Celluose**	16.93±1.02	25.71±0.93
Lignin**	23.67±0.98	13.51±1.31

** denote for P<0.01

Blood biochemical analysis as shown in table 63 revealed better urea recycling in GR group than SF group (52.52vs 42.64mg/dl) indicated low protein intake from grazing. A non significant difference was observed in blood mineral profile of two groups. Biometrical parameters recorded at 30 days showed only significant difference for body length. (Table-64)

Table-63. Blood biochemical parameters

	GR	SF
Total Protein(g/dl)	5.71±0.17	5.73±0.95
Albumin (g/dl)*	2.72±0.084	3.02±0.082
Globulin(g/dl)	2.99±0.18	2.70±0.08
Glucose (mg/dl)**	47.44±4.53	94.06±1.86
Urea (mg/dl)**	53.52±1.39	42.64±1.19
Calcium (mg/dl)	10.39±1.72	10.93±2.86
Phosphorus(mg/dl)	6.09±0.23	6.35±0.23
Magnesium(mg/dl)	3.57±0.27	3.74±0.13
Mn (ppm)	1.11±0.093	1.35±0.15
Zn (ppm)	1.42±0.20	1.72±0.23
Cu (ppm)	1.70±0.81	0.98±0.06
Fe (ppm)	28.71±3.07	31.21±1.51

*** denote respectively for P<0.05 and ** for P<0.01**

Table-64. Biometrical parameters (cm)

Body Length					
Days	d 30**	d 60**	d 90*	d 20	Pooled**
Grazing	125.60±1.68	128.60±1.69	131.70±1.88	133±1.40	129.72±1.42
Stall fed	130.10±1.14	133±1.29	135.85±0.86	136.80±0.98	133.92±0.98
Body Height					
Grazing	177.60±1.70	179.90±1.14	181.70±1.30	183.80±1.33	180.75±1.14
Stall fed	181.30±2.18	183.70±2.32	186.30±2.44	187.30±2.30	184.65±2.22
Heart girth					
Grazing	161.60±16	181.30±1.35	181±1.68	182.50±1.77	176.60±3.41
Stall fed	178.10±1.94	183.20±2.44	185.50±2.55	185.90±2.76	183.17±2.29

* denote respectively for P<0.05 and ** for P<0.01

Average final bodyweight of SF group was (356.0±10.77) significantly higher than GR group (299.7±6.32). The GR group could just maintain the body weight despite of higher intake from grazing land. (Table-65) The SF group gain 62.50±3.59 body weight with an average growth rate 781 g/d (Fig.55). The study revealed that grazing alone could not support the growth of calves and supplementation is needed to achieve better growth and health.

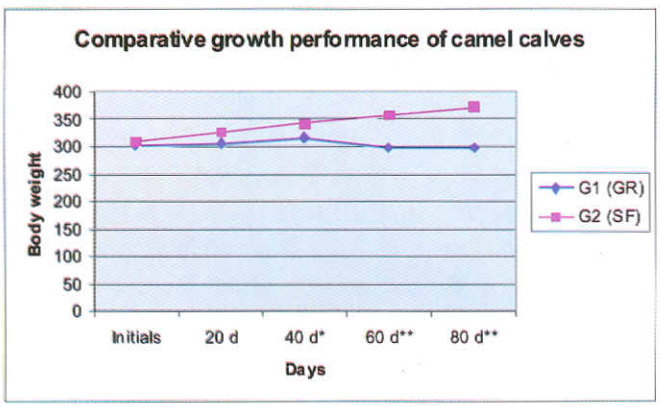
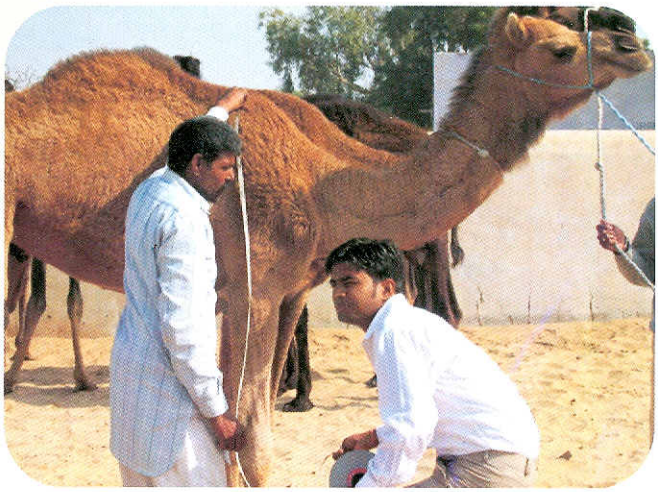


Fig-55. Comparative growth performance of camel calves

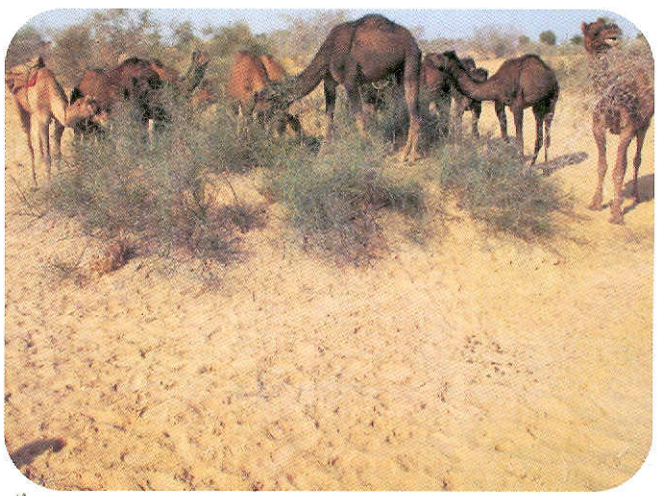
Table-65. Comparative growth performance of camel calves during experimental period

Body weight (kg)	G1 (Grazing)	G2 (Stall fed)
Initials	299.5±6.93	306.5±9.97
20 d	304±6.69	324±10.66
40 d*	316±6.40	340.5±11.74
60 d**	298.5±6.52	356±10.77
80 d**	297.7±7.09	369±10.24
Gain/ loss (kg)		
20 d**	4.5±1.05	17.50±1.68
40 d	12±6.00	16.50±3.30
60 d**	-17.5±3.64	15.50±4.59
80 d*	1.2±2.44	13.00±2.44
Average daily gain		
20 d**	0.225±0.05	0.875±0.09
40 d	0.600±0.33	0.825±0.18
60 d**	-0.875±0.20	0.775±0.25
80 d*	0.60±.12	0.650±0.13



Recording the biometry of camel calves

Supplementary feeding at camel owner's house



Feeding at the grazing land

Forage production Unit

Seasonal crops were sown in 25.25 ha of farm area. Camels were allowed to graze in 20.25 ha where as 920.6 quintals of green fodder was harvested from the remaining area. The rain fed crops namely Sewan (*Lasiurus sindicus*) and Dhaman (*Cenchrus setigerus*) were sown in 45 ha of land. The grammna (*Panicum antidotale*) pasture was developed in 10 ha of land under the irrigation system. The landscaping work was undertaken in 1 ha of the farm area. The ornamental and shadow trees (692) were also planted in the farm.

Utility of camel and its products

4. Technology Assessed and Transferred

Camel milk powder: It was prepared by lyophilizing the raw, pasteurized and boiled camel milk. Camel milk powder is white in color with normal odor and salty taste. Highest yield was observed for the powder prepared with boiled camel milk followed by pasteurized camel milk. Sensory evaluation was carried out for the powder prepared from pasteurized and boiled camel milk. Smell, color, body, taste and overall acceptability were found to be almost same in both types of lyophilized powder.

Camel milk khoa or mawa: Khoa was prepared from camel milk. Hot mawa has butter-like consistency, after cooling; it turns into semi-solid dough. No change in taste has been observed up to 30 days at refrigerated temperature. It can be kept for longer periods after addition of sugar. The smell, color, body, taste and overall acceptability for camel milk mawa were found to be satisfactory.

Camel milk barfi: Camel milk barfi was prepared from camel milk khoa which can be used for at least 3-4weeks without any change in the taste at room temperature and more than 3 months, when stored at refrigerating temperature. The smell, color, body, taste and overall acceptability for camel milk barfi were found to be satisfactory and acceptable on an average.

Transfer of technical know-how : Attempts have been made to transfer the technical know-how of electricity generation by camel and electrification of traditional two wheel camel cart. Efforts have been made to popularize the technical know-how of preparation of camel milk products among common people, farmers and other stake holders. Flavored milk, tea, coffee and Kulfi made of camel milk has been provided to various national and international visitors.

Award winning teams of NRCC

5. Education, Training and Awards

1. Dr S. C. Mehta got an international training under National Agricultural Innovation Project (NAIP) at Iowa State University, Ames in the area of Marker Assisted Selection on the topic "Differential gene expression through RNA-Seq and transcriptome analysis" from June 11 to Sept 16, 2009. He made Presentations at the Meat Animal Research Centre (MARC), United States Department of Agriculture (USDA), Clay Centre, Nebraska, on August 13-14, 2009. He had discussions at the Department of Microbiology and Molecular Genetics, University of California, Irvine, CA, September 3 - 8, 2009 and Nichols Farms, 2188, Clay Avenue, Bridgewater, Iowa, on August 15, 2009 regarding the latest research techniques in the field of molecular biology.
2. Dr. A. K. Nagpal participated in a training programme "Computer par Hindi Prayog" from 17-21 August, 2009 at C-DAC, Connaught Place, New Delhi.
3. Dr S. K. Ghorui participated in a special training programme on "Vigilance Administration & Management", at NIAN&P, Bengaluru, from May 25–27, 2009.
4. Dr Sumant Vyas attended a trainings on "Creative writing in Agriculture" at Indian Institute of Mass Communication, New Delhi, from 3-7 Novemebr 2009 and on "Priority Setting, Monitoring and Evaluation for Innovation in Agriculture" at IIM Lucknow from 22-26 March 2010 under the Learning and Capacity building component of NAINP.
5. Two days training was imparted to camel breeders from Jaisalmer on "clean and hygienic milk production in camel" at this centre on 13-14 October, 2009.
6. Dr Sumant Vyas won first prize in general knowledge competition and second prize in Ashu-lekhan organized by Rajbhasha unit of our Centre. He also won second prize in Quiz competition at a competition among the member offices under Nagar Rajbhasha Karyanvayan Samiti organized by DRM office Bikaner during Hindi Pakhwada- 2009.
7. Dr (Mrs) Nirmala Saini won a gold medal in the shot put event of ICAR zonal tournament held at C.S.W.R.I. Avikanagar Rajasthan.
8. Shri Mohan Singh Technical Officer, T-5 has won a life time achievement award for participating and winning sporting events in ICAR national tournament held at N.D.R.I. Karnal.
9. The centre has got a first prize in Volleyball (Shooting), Discus throw and Shot put events (Sh. Mohan Singh) of ICAR zonal tournament held at CSWRI Avikanagar from 10-14 February 2010.
10. Shri Sanwata Ram was honoured as a senior sports person at the ICAR zonal tournament held at CSWRI Avikanagar.
11. The centre has received an appreciation certificate from Nagar Rajbhasha Karyanvayan Samiti Bikaner for doing excellent work for the promotion of Hindi usage at our centre.

RAC visits NRCC

6. Linkages and Collaborations

National

Collaborative University/Institute	Programme
Rajasthan Agricultral University, Bikaner	Research work of M.V.Sc.and Ph.D. student
Bikaner University, Bikaner	Research work of Ph.D. students
Maharana Pratap University of Agriculture and Technology, Udaipur	Camel drawn implements and electrical generation.
Sardar Patel Medical College, Bikaner	Development of anti-snake venom. Anti-wrinkling properties of camel milk cream based skin ointment.
Bhabha Atomic Research Centre, Mumbai	Development of single domain for diagnosis/ therapy
Indian Veterinary Research Institute, Mukteshwar	Development of a cell culture adapted live attenuated camel pox vaccine
Urmul Dairy, Bikaner	Marketing of camel milk
Lokhit Pashupalak Sansthan, NGO at Sadri, Pali	Extension of camel husbandry practices
Central Arid Zone Research Institute, Jodhpur	Evaluation of nutritive value of Lama seed as feed resources in camel
National Research Centre on Equine, Bikaner	Studies on four MHC class II loci in donkey
International	
Hejen (Camel)Racing Committee, State of Qatar	International project on Molecular genotyping of Sudanese Camel Types

Foundation day celebration at NRCC

7. List of Publications

Research Papers

1. Bhakat Champak, Saini N and Pathak K M L (2009). Comparative study on camel management systems for economic sustainability. Journal of Camel Practice and Research. 16 (1): 77- 81.
2. Bhakat Champak and Pathak K M L (2009). Socio-economic aspects of dromedary camel management in hot arid desert ecosystem. Indian Journal of Animal Sciences. 79 (7): 700-705.
3. Bhakat Champak, Saini N and Pathak K M L (2009). Camel rearing in different management practices under arid ecosystem. *Indian Veterinary Journal*. 86 (8): 828-831.
4. Bhakat Champak, Saini N and Pathak K M L (2009). Growth characteristics, economics and hair mineral status of camel calves reared in different systems of management. *Indian Journal of Animal Sciences*. 79 (9): 932–935.
5. Dubey Ashok, Ghorui S K and Kashyap S K (2009) Differentiation of *Staphylococcus aureus* strains based on 16S-23S ribosomal RNA intergenic space polymorphism. *Indian Journal of Biotechnology*, 8 (7): 276-279.
6. Gorakh Mal, D. Suchitra Sena and M.S. Sahani (2009). Preparation of different products from camel milk. *Indian Veterinary Journal*. 86: 520-521.
7. Mehta, S.C., Bapna, D.L. and Bhure, S.K. (2010). Mathematical functions for the prediction of growth in Indian dromedary genotypes. *The Indian Journal of Animal Sciences*. 80 (2) : 148-151.
8. Mehta, S.C., Pathak, K.M.L., Bhardwaj, B., Arora, S. and Bhatnagar, C.S. (2009). Camel Dairying : An Indian Perspective. *Indian Journal of Animal Sciences*. 79 (4) 454-456.
9. Sahani, M.S., Bapna, D.L. and Mehta, S.C. (2010). Impact of selection on growth of Marwari lambs. *The Indian Journal of Animal Sciences*. 80 (2) : 69-71.
10. Mehta, S.C., Potdar, V.V. and Sahani, M.S. (2009). RFLP analysis of k-casein gene in livestock species. *Indian Veterinary Journal*. 86 (6) 594-596.
11. Sahani, M.S., Bapna, D.L. and Mehta, S.C. (2009). Growth of Karakul and its crosses with indigenous sheep breeds in hot arid region. *The Indian Journal of Animal Sciences*. 79 (5) : 528-529.
12. Sharma, R.C., Mehta, S.C., Bansal, R.S. and Pathak, K.M.L. (2009). PCR-RFLP profile of MHC-DRB3 class II genes in Marwari horses. *The Indian Journal of Animal Sciences*. 79 (10) : 1036-1037.
13. Saini, N, Singh, N, Kiradoo B D and Pathak K M L (2009). Comparative biochemical and mineral profile of female Indian dromedaries during breeding season. Journal of Camel Practice and Research, 16(2): p 189-193.
14. Tuteja, F.C. and Dixit, S.K. (2009). Effectiveness of medicinal herbs against dromedary mastitis isolates. *Journal of Camel Practice and Research*. 16:83-88.
15. Vyas, S. and Sahani, M.S. (2009). Effect of Clomiphene citrate and Super-OV on the augmentation of ovarian activity in camel heifers. *Indian Veterinary Journal*. 86: 1030-1031.

Papers presented in Conferences, Symposia and Seminars

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Project presentation at NRCC

8. List of Ongoing Research Projects

S. N.	Name of Project	Code N.
	Camel Breeding and Genetics	
1.	Studies on qualitative and quantitative genetic parameters in Indian Camel	AGB-1
2.	Selection for the improvement of draughtability of camel breeds	AGB-4
3.	Genetic improvement of milk production potential of Indian dromedary	AGB-7
4.	Molecular genetic studies in Indian camel	AGB-2
	Camel Health	
5.	Epidemiology of infectious diseases of camel.	VM -8
	Sub projects:	
	a. Epidemiology of bacterial and fungal diseases of camels	
	b. Epidemiology of major parasitic diseases of camels	
	c. Epidemiology of viral diseases of camels	
6	Studies on metabolic and deficiency diseases in dromedary camel	VM-10
7.	Evaluation and validation of ethno-veterinary practices against camel diseases.	VM-5
8	Therapeutic spectrum of selected herbs against dermatophytes / bacteria..	VM-3
9	Investigations on digestion fermentation disorder with particular reference to indigestion and impaction	VM-7
10	Immunity status in neonatal calves	VM-4
11.	Molecular cloning and characterization of cameline cytokine gene(s)	BT-AS-1
12	Management of GI parasites in camel herd and molecular characterization of anthelmintic resistant strains of parasites	VP-2
	Inter-institutional	
13.	Development of a new camelid anti snake venom – (with SP Medical college, Bikaner)	VM- 9
14.	Development of single domain antibodies for diagnosis/therapy-inter institutional project with BARC, Mumbai	BT-AS-2
15.	Development of a cell culture adapted live attenuated camel pox vaccine (with IVRI, Izatnagar)	BT-AS-3
16.	Molecular Diagnosis of tuberculosis (with IVRI,Izatnagar)	VM-11
17	Bio-prospecting of genes and allele mining for heat and cold stress tolerance in Indian	

S. N.	Name of Project	Code N.
	Camel Reproduction	
18.	Identification of factors responsible for reproductive disorders and development of technology for countering the same	AR-4
19.	Improving the efficiency of artificial insemination in camel using existing and emerging technologies	AR-5
20.	Role of sexual and bio-stimulation in camel reproduction	AR-6
21.	Studies on biochemical parameters of semen for increasing its efficacy	AR-2
	Camel Nutrition	
22.	Studies on nutrient requirement and feed resource availability in camel for optimum production.	AN-3
23.	Enhancing nutrient utilization and reducing methane emission	AN-5
24.	Veterinary type culture rumen microbes	Network Project
25.	Improvement of feed resources and nutrient utilization in raising animal production.	AICRP
	Livestock Production Management	
26.	Developing camel management practices in present and impending climate change scenario	LPM-1
	Camel Physiology	
27.	Efficient utilization of camel energy during cart pulling and agricultural operations by camels.	AP-2
28.	Adaptation of camel to climatic changes in relation to temperature humidity index	AP-6
	Camel Biochemistry	
29.	Processing, value addition and commercialization of different camel Products and by-products	AP-3
30.	Evaluation of camel milk for its therapeutic value and its exploitation as functional food	AP-5
31.	Evaluation of anti-wrinkling property of camel milk cream in human - Inter-institutional project – SPMC, Bikaner	AP-4
32	Identification, characterization and structural studies of proteins from camel milk. Inter-institutional project- AIIMS	

9. QRT, IMC, RAC and IRC Meetings

Research Advisory Committee

The meeting of the RAC of NRCC, Bikaner was held in the Committee Room of NRCC, Bikaner on November, 16, 2009 at 11.00 AM. The following members were present in the meeting:

1. Dr. Nagendra Sharma : Chairman
2. Prof. K.M.L. Pathak : Member
3. Dr. N.D. Khanna : Member
4. Dr. M. B. Chhabra : Member
5. Dr. Gaya Prasad : Member
6. Col. (Dr.) Rout : Member
7. Sh. Shree Gopal Upadhyay : Member
8. Sh. M. K. Jhajharia : Member
9. Dr. Sumant Vyas : Member Secretary

The chairman and members were highly satisfied with the over all improvement in the progress made by the centre in the various research projects and new linkages developed to explore collaborative research and recommended that NRCC should be upgraded to the status of an institute.

QRT Meeting

The Quinquennial Review Team for National Research Centre on Camel, Bikaner for the period 2003-07 comprised of

1. Dr. Nagendra Sharma : Chairman
2. Dr. C. S. Prasad : Member
3. Prof. K.M.L. Pathak : Member
4. Dr. N.D. Khanna : Member
5. Dr. M. B. Chhabra : Member
6. Dr. Gaya Prasad : Member
7. Sh. Shree Gopal Upadhyay : Member
8. Dr. Sumant Vyas : Member Secretary

The first meeting was held on 16.3.09 at the NRCC, Bikaner. The Chairman called second meeting on 20th April, 2009 at Krishi Bhavan, New Delhi for getting inputs from the members. The third meeting of QRT was held on 10.8.09 at NAAS Complex, New Delhi for getting final inputs from the members. The report was finalized after thorough discussion for submission to ICAR. Before final submission of the report Chairman held a meeting with the members of Institute management Committee on 22.8.09 at CSWRI Guest House, Jaipur. The QRT has recommended that as the centre has inadequate scientific manpower and infrastructure facilities to take up basic research. Therefore, the council should be approached to fill up all vacant posts. The QRT recommended that in view of the revised extended mandate, new programmes, national and international responsibilities, the NRC on Camel should be promoted to full fledged Central Institute on Camel Research. The QRT suggested a laboratory of Camel Immunology should be established at the centre and efforts should be made to reduce inter-calving period in camel. The QRT members evaluated the performance of NRC on Camel on the basis of its mandate and recommendations of 10th Five Year plan and wrote that the research work output, infrastructural development including up gradation of laboratory facilities and farm development was very satisfactory and can be rated as very good.

Institute Research Council

The annual meeting of Institute Research Council

was held on 23rd May, 2009 under the chairmanship of the Director NRCC. The following external experts participated in the meeting

1. Prof. K. M. L Pathak, Director - Chairman
2. Prof. S. B. S. Yadav, Director Research (VAS), RAU, Bikaner
3. Prof. A. K. Purohit, Director Extension, RAU, Bikaner
4. Dr. R. C. Jakhmola, Head, CSWRI Regional Station, Bikaner
5. Dr. M. B. Chhabra, Prof & Head (Rtd.), New Delhi
6. Prof. G. Prasad, Department of Animal Biotechnology, CCSHAU, Hissar
7. Dr. R. K. Tanwar, Head, Department of Preventive Medicine, College of Veterinary and Animal Science, RAU, Bikaner
8. Dr. Rishendra Verma, Head, Division of Biological Standardization, Indian Veterinary Research Institute, Izatnagar- 243 122 (U.P.)
9. Dr. Dhirendra Singh, PS & Head, Division of Animal Health, CSWRI, Avikanagar ash Sharma, Jt. Director, Deptt. of Ani . Husbandry Bikaner Division

The half yearly review meeting of the Institute Research council was held on 16.11.209.

Institute Management Committee

It was held on 16.4.09 and following members participated-

1. Prof. K.M.L. Pathak, Director NRCC, Bikaner
2. Dr. C. S. Prasad ADG (AN&P), ICAR, New Delhi
3. Dr. S. B. S. Yadav, Director Research, VAS,RAU, Bikaner
4. Dr. R. S. Singh, PS, & Head CIAH, Bikaner
5. Dr. R. C. Sharma, Sr. Scientist, (Animal Breeding & Genetics), NRCE, Bikaner
6. Shri Shri Gopal Upadhyay, Ex- Sarpanch, Lolasar Gram Panchayat, Bikaner
7. Sh. K. P. Sharma ,AAO, NRCC, Bikaner
8. Dr. Sailash Sharma, Jt. Director, Deptt. of Ani . Husbandry Bikaner Division

The second meeting was held on 22.8.2009 at CSWRI Guest House, Jaipur and was chaired by Dr M.P. Yadav , Chairman, QRT of the Centre. It was attended by the following members,

1. Prof. K.M.L. Pathak, Director NRCC, Bikaner
2. Dr. C. S. Prasad ADG (AN&P), ICAR, New Delhi
3. Dr. Rajesh Sharma, Director. Deptt. of Ani, Husbandry, Govt of Rajasthan, Jaipur
4. Dr. A. J. Kachhia Patel, Director, Deptt. of Ani, Husbandry, Govt. of Gujarat, Gandhinagar, Gujarat
5. Dr. S. B. S. Yadav, Director Research, VAS,RAU, Bikaner
6. Dr. N. V. Patil, PS & Acting Director, CAZRI, Jodhpur
7. Dr. Arun Kumar, PS, CAZRI, Jodhpur
8. Dr. R. S. Singh, PS, & Head CIAH, Bikaner
9. Dr. R. C. Sharma, Sr. Scientist, (Animal Breeding & Genetics), NRCE, Bikaner
10. Sh. M. K. Jhaiharia, Jhunjhunu, Rajasthan
11. Sh. Shri Gopal Upadhyay, Ex- Sarpanch, Lolasar Gram Panchayat, Bikaner
12. Dr. U. K. Bissa, Sr. Scientist, NRCC, Bikaner
13. Dr Sumant Vyas, Sr. Scientist & member Secretary, QRT.

10.Participation in Conferences, Meetings, Workshops and Symposia

Name	Meetings, Seminars, Workshops and Symposia	Date
Prof. K. M. L. Pathak	13th Biennial Annual Nutrition Conference at National Institute of Animal Nutrition and Physiology, Bengaluru Karnataka	17-19 Dec., 2009
	International Conference on Nurturing arid zones for people and the environment issue and agenda for the 21 century held at CAZRI, Jodhpur (Rajasthan	24-28 Nov., 2009
	20th National Congress of Veterinary Parasitology held at *College of Veterinary Sciences, CCS HAU, Hisar (Haryana*	18-20 Febr., 2010
	National Seminar on Frontiers in Biotechnology-2009 organized by Bharathiar University, Coimbatore – 641 046 (Tamilnadu	22 -24 July, 2009
	XVI Annual Conference of ISVIB organized by Veterinary College and Research Institute, Namakkal- 637002 (Tamilnadu	8-10 April, 2010
	XIX National Conference, Indian Virological Society (IVS), organized by the Department of Virology, Sri Venkateswara university, Tirupati-517 502 (A.P.)	18-20 March, 2010
	International Conference on Protecting animal health: facilitating trade in livestock and livestock products, organized by College of Veterinary Science and Animal Husbandry,Indira Gandhi Krishi Vishwavidyalaya,Raipur (Chhattisgarh	27-29 Jan., 2010
Dr R. K. Singh	XVI Annual Conference of ISVIB organized by Veterinary College and Research Institute, Namakkal- 637002 (Tamilnadu)	8-10 April, 2010
Dr S. K. Ghorui,	20th National Congress of Veterinary Parasitology held at *College of Veterinary Sciences, CCS HAU, Hisar (Haryana)*	18-20 Feb., 2010
	National Seminar on Frontiers in Biotechnology-2009 organized by Bharathiar University, Coimbatore – 641 046 (Tamilnadu)	22-24 July, 2009
	XVI Annual Conference of ISVIB organized by Veterinary College and Research Institute, Namakkal- 637002 (Tamilnadu)	8-10 April, 2010
	XIX National Conference, Indian Virological Society (IVS), organized by the Department of Virology, Sri Venkateswara university, Tirupati-517 502 (A.P.)	18-20 March, 2010
	International Conference on Protecting animal health: facilitating trade in livestock and livestock products, organized by College of Veterinary Science and Animal Husbandry,Indira Gandhi Krishi Vishwavidyalaya,Raipur (Chhattisgarh)	27-29 Jan., 2010
Dr A. K. Nagpal	13th Biennial Annual Nutrition Conference at National Institute of Animal Nutrition and Physiology, Bengaluru (Karnataka)	17-19 Dec., 2009
	International Buffalo Conference at NASC complex, New Delhi	1-4 Feb., 2010

Dr A. K. Roy,	13th Biennial Annual Nutrition Conference at National Institute of Animal Nutrition and Physiology, Bengaluru (Karnataka)	17-19 Dec., 2009
	Interaction Meet between scientists of CIAE, Animal Science and Fisheries Institutes of ICAR held at Central Institute of Agricultural Engineering (ICAR) Bhopal (M.P.)	11-12 January, 2010
	International Buffalo Conference at NASC complex, New Delhi	1-4 February, 2010
Dr F. C. Tuteja	Workshop on Diagnostic Mycology and XXXIII National Conference of Indian Association of Medical Microbiologists, J.S.S. Medical College, Mysore (Karnataka)	3-8 Nov., 2009
	National Conference of Committee for the purpose of control and supervision of Experiments on Animals (CPCSEA) held at India Habitat Centre, Lodhi Road, New Delhi, organized by Animal Welfare Division. Ministry of Environment and Forests, Government of India, New Delhi	15 Jan., 2010
	National Symposium on 'Recent Developments in Diagnostic and Therapeutic Approaches for Economically Important Diseases of Livestock and Companion Animals' and 28th Annual convention of Indian Society for Veterinary Medicine, College of Veterinary Science, Sri Venkateswara University, Rajendranagar, Hyderabad	17-19 Feb., 2010
Dr Sumant Vyas,	"Creative writing in Agriculture" at Indian Institute of Mass Communication, New Delhi	3-7 Nove., 2009
	13th Biennial Annual Nutrition Conference at National Institute of Animal Nutrition and Physiology, Bengaluru (Karnataka)	17-19 Dec., 2009
	20th National Congress of Veterinary Parasitology held at *College of Veterinary Sciences, CCS HAU, Hisar (Haryana)*	18-20 Feb., 2010
	Consultation on enhancing open access in Indian Agriculture: Prospects, opportunities, advantages and challenges" held at ICRISAT, Patancheru (Andhra Pradesh)	6-7 Sep., 2009
	Priority Setting, Monitoring and Evaluation for Innovation in Agriculture" at IIM Lucknow under the Learning and Capacity building component of NAINP	22-26 March, 2010
Dr Champak Bhakat,	International Conference on Nurturing arid zones for people and the environment issue and agenda for the 21 century held at CAZRI, Jodhpur (Rajasthan)	24-28 Nov., 2009
Dr Gorakh Mal,	ICAR Zonal Technology Management and Business Planning and Development meeting-cum-workshop at IVRI, Izatnagar, U. P.	26-27 March, 2010
Dr Sanjay Kumar,	20th National Congress of Veterinary Parasitology held at *College of Veterinary Sciences, CCS HAU, Hisar (Haryana)*	18-20 Feb., 2010
	National Seminar on Frontiers in Biotechnology-2009 organized by Bharathiar University, Coimbatore – 641 046 (Tamilnadu)	22-24 July, 2009
	XVI Annual Conference of ISVIB organized by Veterinary College and Research Institute, Namakkal- 637002 (Tamilnadu)	8-10 April, 2010

	XIX National Conference, Indian Virological Society (IVS), organized by the Department of Virology, Sri Venkateswara university, Tirupati-517 502 (A.P.)	18-20 March, 2010
	International Conference on Protecting animal health: facilitating trade in livestock and livestock products, organized by College of Veterinary Science and Animal Husbandry,Indira Gandhi Krishi Vishwavidyalaya,Raipur (Chhattisgarh)	27-29 Jan., 2010
Dr Shirish Dadarao Narnaware	XVI Annual Conference of ISVIB organized by Veterinary College and Research Institute, Namakkal- 637002 (Tamilnadu)	8-10 April, 2010
Dr.(Mrs.)Nirmala Saini,	International Conference on Nurturing arid zones for people and the environment issue and agenda for the 21 century held at CAZRI, Jodhpur	24-28 Nov., 2009
	13th Biennial Annual Nutrition Conference at National Institute of Animal Nutrition and Physiology, Bengaluru Karnataka	17-19 Dec., 2009
Dr U. K. Bissa,	13th Biennial Annual Nutrition Conference at National Institute of Animal Nutrition and Physiology, Bengaluru (Karnataka)	17-19 Dec., 2009
Dr G. Nagarajan	20th National Congress of Veterinary Parasitology held at College of Veterinary Sciences, CCS HAU, Hisar (Haryana)	18-20 Feb., 2010
	National Seminar on Frontiers in Biotechnology-2009 organized by Bharathiar University Coimbatore – 641046 (Tamilnadu)	22-24 July, 2009
	XVI Annual Conference of ISVIB organized by Veterinary College and Research Institute, Namakkal- 637002 (Tamilnadu)	8-10 April, 2010
	XIX National Conference, Indian Virological Society (IVS), organized by the Department of Virology, Sri Venkateswara university, Tirupati-517 502 (A.P.)	18-20 March, 2010
	International Conference on Protecting animal health: facilitating trade in livestock and livestock products, organized by College of Veterinary Science and Animal Husbandry,Indira Gandhi Krishi Vishwavidyalaya,Raipur (Chhattisgarh	27-29 Jan., 2010
Shri Dinesh Munjal	INational workshop for the sensitization of the ARIS In charge about the uniformity guidelines for the website at NBAGR, Delhi	19 March, 2010
Dr. N. Sharma	13th Biennial Annual Nutrition Conference at National Institute of Animal Nutrition and Physiology, Bengaluru (Karnataka)	17-19 Dec., 2009
Shri Ram Dayal	International Conference on Academic Libraries (ICAL-2009) organized by Delhi University Library System at University of Delhi, Delhi	5-8 Oct., 2009
	Workshop of Consortium Strengthening of Library and Information Management under NARS (e-Granth)" at Indian Agricultural Research Institute (IARI), New Delhi	27-28 Aug., 2009

Dr Arjun Lukkha,	13th Biennial Annual Nutrition Conference at National Institute of Animal Nutrition and Physiology, Bengaluru (Karnataka)	17-19, Dec., 2009
	International Conference on Nurturing arid zones for people and the environment issue and agenda for the 21 century held at CAZRI, Jodhpur	24-28 Nov., 2009
Dr B. D. Kiradoo	13th Biennial Annual Nutrition Conference at National Institute of Animal Nutrition and Physiology, Bengaluru (Karnataka)	17-19 Dec., 2009
	International Conference on Nurturing arid zones for people and the environment issue and agenda for the 21 century held at	24-28 Nov., 2009
Dr Shelesh Kumar swami	XVI Annual Conference of ISVIB organized by Veterinary College and Research Institute, Namakkal- 637002 (Tamilnadu)	8-10 April, 2010
	XIX National Conference, Indian Virological Society (IVS), organized by the Department of Virology, Sri Venkateswara university, Tirupati-517 502 (A.P.)	18-20 March, 2010
	International Conference on Protecting animal health: facilitating trade in livestock and livestock products, organized by College of Veterinary Science and Animal Husbandry, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh	27-29 Jan., 2010

11. Distinguished Visitors, Appreciation and Awards

Distinguished Visitors

20.4.2009

Shri J. Patankar, IAS, A-42 Nivedita Kung, Sector 10 R. K. Puram, New Delhi

Shri Arun Singhal, IAS, CVO, GAIL, New Delhi

18.5.2009

J. Dhakwala, IAS, Secretary M.P. Govt. Bhopal

K.K. Pathak, IAS , DM, Churu, Rajasthan

Meenakshi Mishra, Accountant General Rajasthan

1.7.2009

Dr. S. P. S Ahlawat, VC Vikaram University Ijjain (M.P.)

9.10.2009

Shri Harji Ram Burdak, Agriculture and Animal Husbandry Minister, Govt. of Rajasthan, Jaipur

7.11.09

Dr R.M. Acharya, Former DDG (AS), ICAR

16.11.09

Dr Nagendra Sharma, Ex VC, SKUAST (J) and Director NDRI (Retd.)

26.12.09

Sh. Rajendra Kumar Tiwari, IAS Joint Secretary to Govt. of India Ministry of Agril. New Delhi

26.12.09

Dr. Prof. Meera Agnihotri, State President of Federation of Obstetrics & Gynaecologist, India

9.01.2010

Dr. C. D. Mayee, Chairman, ASRB, New Delhi

25.01.10

Shri Nilotpal Goswami, Principal Director (Audit)

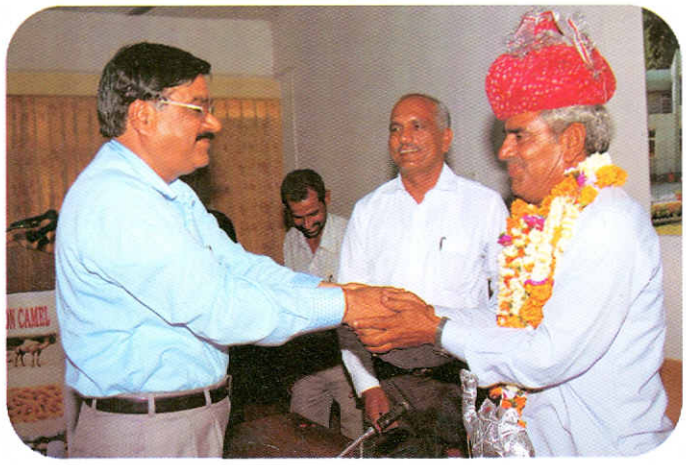
4.02.10

Justice Surinder S. Thakur, H.P. High Court, Shimla

12.03.2010

Prof. M. J. Modayel Member A.S.R.B, New Delhi

NRCC activities



12. Personnel

Director

Dr. R.K. Singh, Director (Additional Charge)

Principal Scientist

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

Senior Scientist

1. Dr. A. K. Nagpal, Animal Nutrition
2. Dr. S. K. Ghorui, Veterinary Parasitology
3. Dr. A. K. Roy, Animal Physiology
4. Dr. Sumant Vyas, Animal Reproduction
5. Dr. Raghvendra Singh, (On Deputation)
6. Dr. F. C. Tuteja, Veterinary Medicine
7. Dr. Gorakh Mal, Animal Bio-Chemistry
8. Dr. C. Bhakat, Live Stock Production Management
9. Dr. (Mrs.) D. Suchitra Sena, Veterinary Medicine
10. Dr. (Mrs.) Nirmala Saini, Animal Nutrition
11. Dr. U .K. Bissa, Animal Genetics & Breeding

Scientist(Senior Scale)

Dr. G. Nagarajan, Animal Bio-technology

Scientist

1. Dr. Sanjay Kumar, Veterinary Parasitology
2. Dr. Narnaware Shirish Dadarao, Vet. Pathology
3. Dr. Devendra Kumar, Livestock Prod. Technology

Technical

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

Administration

Sh. K. P. Sharma, Assistant Administrative Officer

Sh. Raj Kumar, Assistant Finance & Accounts Officer

Glimpses of extended camel museum

13. Infrastructure Development

The camel museum has been extended to accommodate more exhibits to make it more informative for the tourists which is crucial for the revenue generation programme of the centre. The milk parlour has been shifted at a new place to make it convenient for the buyers to enjoy camel milk products. A silver jubilee park has been developed just opposite to the milk parlour to enhance the attraction of tourists at the centre. A porch has been added to the administrative building to protect it from sun and storms. The assembly hall at the first floor of the research lab building has also been renovated to a new look.

केन्द्र में राजभाषा गतिविधियां

14. केन्द्र की राजभाषा संबंधी गतिविधियां

हिन्दी पखवाड़ा, 2009

14 सितम्बर–हिन्दी दिवस के शुभ उपलक्ष्य पर निदेशक प्रो.के.एम.एल.पाठक द्वारा केन्द्र में 14–29 सितम्बर तक हिन्दी पखवाड़ा मनाए जाने की विधिवत् घोषणा के साथ प्रारम्भ हुआ।

हिन्दी पखवाड़े के उद्घाटन समारोह पर मुख्य अतिथि के रूप में डॉ.ए.के.गहलोत, अधिष्ठाता, पशु चिकित्सा एवं पशु विज्ञान महाविद्यालय, रा.कृ.वि., बीकानेर ने अपने अभिभाषण में कहा कि हिन्दी भाषा की सबसे बड़ी विशेषता यह है कि जो हम लिखते हैं वैसे ही उसका उच्चारण करते हैं। हिन्दी भाषा की सबसे बड़ी ताकत उसकी समृद्ध शब्द संपदा है। इसमें हर रिश्ते नाते के अलग– अलग नाम के शब्द उपलब्ध हैं।

इस अवसर पर मुख्य वक्ता के रूप में डॉ. चन्द्र प्रकाश यादव, स्नातकोतर अध्यापक, केन्द्रीय विद्यालय नम्बर 1, बीकानेर ने जन सामान्य की भाषा हिन्दी जिस रूप में है वैसे ही अपनाने की बात पर जोर दिया। उन्होंने कहा कि यह हिन्दी भाषा का समृद्धकाल है। हिन्दी दिवस के शुभ अवसर पर डॉ.ए.के.पुरोहित, निदेशक, कामधेनु ज्ञान केन्द्र, बीकानेर ने भी यह स्वीकार किया कि हिन्दी दिलों के निकट की भाषा है।

उद्घाटन समारोह के इस अवसर पर केन्द्र निदेशक प्रो.के. एम.एल.पाठक ने कहा कि केन्द्र द्वारा हिन्दी दिवस को महज परंपरा के रूप में नहीं लिया जाता अपितु कार्यक्षेत्र में भी अपनाकर इसे सिद्ध किया जा रहा है। हमारे केन्द्र की प्रत्येक मौलिक व नूतन शोध की जानकारी ऊँट पालकों, किसानों एवं आमजन तक पहुंचाने हेतु हिन्दी भाषा ही सेतु का काम करती है।, निदेशक अनुसंधान (प.चि.एवं प.वि.), राजस्थान कृषि विश्वविद्यालय, बीकानेर ने कहा कि अपनी भाषा में बात करना एक सुखद अनुभूति प्रदान करता है। हिन्दी एक समृद्ध भाषा है और यह अपना विशिष्ट स्थान रखती है।

हिन्दी पखवाड़ा समापन समारोह के मुख्य वक्ता के रूप में डॉ.ए.के.पुरोहित, निदेशक, कामधेनु ज्ञान केन्द्र, बीकानेर ने कहा कि सामान्य जन अपनी रचनाधर्मिता अथवा सृजन कार्य आदि से भाषा से जुड़ाव को रेखांकित करता है तथा इन रूपों में इनका प्रस्तुतिकरण करना अपने आप में पर्याप्त है।

कार्यक्रम की अध्यक्षता करते हुए केन्द्र निदेशक प्रो.के.एम. एल.पाठक ने कहा कि हिन्दी भाषा में सभी प्रकार के विचार, गूढ़ विषयों आदि को प्रकट करने की क्षमता विद्यमान है। यह एक ऐसी भाषा है जो अन्य भाषाओं का भी सम्मान करती है।

केन्द्र में हिन्दी पखवाड़ा के अन्तर्गत हिन्दी में सामान्य ज्ञान प्रश्नोतरी प्रतियोगिता, हिन्दी में आशु लेखन प्रतियोगिता एवं निबन्ध प्रतियोगिता का आयोजन किया गया। सभी विजेताओं को आमंत्रित मुख्य अतिथि महोदय, मुख्य वक्ता एवं केन्द्र निदेशक के कर कमलों द्वारा नकद पुरस्कार वितरित किए गए।

प्रथम राजभाषा कार्यशाला

राजभाषा नीति कार्यान्वयन के अन्तर्गत केन्द्र मे दिनांक 7 अगस्त, 2009 को आयोजित एक दिवसीय राजभाषा कार्यशाला के प्रथम व्याख्यान 'राजभाषा का उत्कृष्ट प्रयोग' पर बोलते हुए डॉ. घनश्याम व्यास, व्याख्याता, बिन्नाणी कन्या महाविद्यालय, बीकानेर ने कहा कि राजभाषा सरकार और जनता के बीच सेतु का काम करती है। यह हमारे जीवन में एक राष्ट्र ऋण के रूप में विद्यमान है तथा हम इसके प्रति दायित्व निर्वाह के पश्चात ही मुक्त हो सकते हैं। अपने व्याख्यान में उन्होंने हिन्दी भाषा के प्रयोग के दौरान शुद्ध–अशुद्ध की भी महत्ता बताई तथा भाषा प्रयोग में दोहरेपन को समाप्त कर एकरूपता लाने पर जोर दिया।

कार्यशाला में 'जीवन जीने की कला' विषयक द्वितीय व्याख्यान के अन्तर्गत श्री राजकुमार भटनागर, शिक्षक, व्यक्ति विकास केन्द्र, बीकानेर ने कहा की आज की भाग–दौड़ भरी जिन्दगी में भी हम सबसे ज्यादा अपने स्वास्थ्य के प्रति जागरूक नहीं है जबकि सबसे महत्वपूर्ण हमारा स्वास्थ्य है। अतिथि वक्ता ने तनाव रहित प्रफुल्लित मन और स्वस्थ शरीर, आत्मविश्वास और सृजनशीलता में निखार, कार्यक्षमता में वृद्धि आदि पर विस्तार पूर्वक अपनी बात कही। कार्यशाला के मुख्य अतिथि के रूप में डा. अरविन्द कुमार पुरोहित, निदेशक, कामधेनु ज्ञान केन्द्र, बीकानेर को आमंत्रित किया गया। कार्यशाला की अध्यक्षता केन्द्र निदेशक प्रो. के.एम.एल. पाठक द्वारा की गई।

द्वितीय राजभाषा कार्यशाला

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर में दिनांक 21.11. 2009 को एक दिवसीय राजभाषा कार्यशाला का आयोजन किया गया। राजभाषा कार्यशाला में व्याख्यान प्रस्तुतिकरण हेतु डॉ. डी. डी. ओझा, सदस्य, संयुक्त हिन्दी सलाहकार समिति, पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय, भारत सरकार, जोधपुर को आमंत्रित किया गया था।

मुख्य अतिथि वक्ता डॉ.डी.डी.ओझा ने "विज्ञान में हिन्दी का प्रयोग अपेक्षित" विषयक अपने व्याख्यान में कहा कि किसी भी भाषा में यदि शब्द पर्याप्त मात्रा में उपलब्ध नहीं हों तो ज्ञान–विज्ञान का साहित्य उपलब्ध नहीं हो सकेगा। भाषा के विकास के लिए हमें इसके प्रति निष्ठा रखनी होगी। अनुसंधान का लाभ देशवासियों को उनकी अपनी भाषा के माध्यम से देने पर ही मिलेगा। इसी प्रकार केन्द्र द्वारा ऊँट पालकों की भाषा में जानकारी पहुंचाने पर सार्थक परिणाम मिलेंगे।

देश के अनेक सम्मानीय पुरस्कार प्राप्त कर चुके अतिथि वक्ता डॉ.डी.डी.ओझा ने स्पष्ट किया कि विज्ञान सत्य को उजागर करता है। हमारे देश की प्रौद्योगिकी को गति प्रदान करने, अंधविश्वास मिटाने तथा रोजगार सुलभ करवाने के लिए वैज्ञानिक चेतना जाग्रत करने की महत्ती आवश्यकता है। विज्ञान एक अनुशासित भाषा है तथा इसमें अपेक्षित शब्दों का ही प्रयोग होता है। यह दोषारोपण कि हिन्दी में विज्ञान विषयों को प्रकट करने हेतु पर्याप्त शब्द भण्डार उपलब्ध नहीं है, भ्रामक है। आज हिन्दी में विज्ञान के लगभग 7.50 लाख शब्द पर्याय उपलब्ध है। अतः हम यह कह सकते हैं कि हिन्दी के माध्यम से विज्ञान का भविष्य उज्ज्वल है।

इस अवसर पर केन्द्र के निदेशक प्रो.के.एम.एल.पाठक ने कहा कि केन्द्र द्वारा भारत सरकार की नीतियों की अनुपालना में केन्द्र द्वारा अधिकाधिक कार्यशालाओं का आयोजन कर राजभाषा को बढ़ावा दिया जा रहा है तथा इन आयोज्य कार्यशालाओं में प्रतिष्ठित वक्ताओं द्वारा व्याख्यान प्रस्तुति करवाने का मुख्य उद्देश्य इन्हें सार्थक रूप दिया जाना है। प्रो. पाठक ने आगे कहा कि आज विज्ञान के विषयों की हिन्दी में प्रस्तुति समय की मांग है। इसके लिए बड़े स्तर पर प्रयास किए जा रहे हैं। भौतिकवादी युग में बहुराष्ट्रीय कम्पनियों द्वारा देश में अपने व्यवसाय एवं उत्पादों को आम जन तक पहुंचाने एवं बेचने के लिए हिन्दी का ही सहारा लिया जा रहा है। इससे हिन्दी की समर्थता निश्चित रूप से प्रकट होती है। यह वह भाषा है जो किसी भी विषय

को सार्थक रूप से प्रस्तुत करने का साहस रखती है। कार्यक्रम का संचालन डॉ.अश्विनी कुमार रॉय, प्रभारी राजभाषा द्वारा किया गया।

तृतीय राजभाषा कार्यशाला

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर में दिनांक 27.03.2010 को एक दिवसीय राजभाषा कार्यशाला का आयोजन किया गया। कार्यशाला में अतिथि वक्ता के रूप में राजकीय डूँगर महाविद्यालय, बीकानेर से डॉ.रजनी रमण झा, वरिष्ठ व्याख्याता को आमन्त्रित किया गया। केन्द्र के प्रभारी राजभाषा डॉ.अश्विनी कुमार रॉय द्वारा राजभाषा कार्यशाला के उद्देश्य व महत्व पर प्रकाश डाला गया।

आमन्त्रित मुख्य अतिथि वक्ता डॉ.रजनी रमण झा ने अपने 'हिन्दी की 'शाश्वतता' विषयक व्याख्यान में कहा कि संख्या की दृष्टि से संसार की किसी भी भाषा का प्रतिशत हिन्दी भाषा से अधिक नहीं है। हिन्दी भाषा में शब्द व भाव के स्तर पर कमाल का संबंध देखा जा सकता है। डॉ.झा ने कहा कि जो राष्ट्र उद्यमी व सर्वशक्तिशाली होगा आगे चलकर उसी देश की भाषा समस्त संसार में अपना प्रभाव जमा लेंगी। इस मामले में हिन्दी की संभावनाएं काफी उज्ज्वल है। आज विश्व में केवल 5–6 भाषाएं तेजी से बढ़ रही है और इनमें हिन्दी प्रथम स्थान पर है।

राजभाषा कार्यशाला के अध्यक्ष एवं केन्द्र निदेशक डॉ.राज कुमार सिंह ने राजभाषा कार्यशालाओं को विचार–विमर्श का एक अच्छा माध्यम बताया। डॉ. सिंह ने कहा कि संसार की किसी भी भाषा को कम नहीं आंकना चाहिए क्योंकि सभी भाषाएं बराबर हैं। उन्होंने हिन्दी भाषा को एक समृद्ध भाषा मानते हुए कहा कि इसमें प्रत्येक रिश्ते–नाते के लिए अलग–अलग शब्द उपलब्ध हैं तथा शब्दों की

इसी विपुलता ने अंग्रेजी भाषा को भी पीछे छोड़ दिया है। उन्होंने कहा कि हमारे वेद, पुराणों जैसे धार्मिक ग्रन्थों में निहित ज्ञान का लाभ आज समस्त विश्व ले रहा है। उन्होंने चीन, जापान, रूस, जर्मनी, फ्रांस, अरब आदि कई देशों के उदाहरण देते हुए कहा कि ये सभी विकसित राष्ट्र अपनी निज भाषा के माध्यम से ही उत्तरोत्तर प्रगति कर रहे हैं। आज भारत देश एक आर्थिक शक्ति के रूप में उभर कर सामने आ रहा हैं। अतः यदि ऐसी स्थिति में हम हिन्दी भाषा को स्वाभिमान के रूप में लेंगे तो दूसरे देशों को भी हमारी शक्ति व सक्षमता का अनुमान होने लगेगा।

केन्द्र को राजभाषा सम्मान

नगर राजभाषा कार्यान्वयन समिति, बीकानेर द्वारा दिनांक 23.06.2009 को आयोजित छःमाही बैठक के अवसर पर वर्ष 2008–09 के लिए राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर को पुरस्कृत किया गया। यह राजभाषा सम्मान श्री आलोक रंजन, अध्यक्ष, नराकास एवं मंडल रेल प्रबंधक तथा श्री राम लाल शर्मा, सहायक निदेशक (रा.भा.), क्षेत्रीय कार्यालय, मध्य क्षेत्र, गृह मंत्रालय, भोपाल के कर कमलों द्वारा प्रदान किया गया।

हिन्दी प्रकाशन

1. राजभाषा वार्षिक पत्रिका 'करभ' (सप्तम् अंक)
2. हिन्दी लघु पुस्तिका 'मैं ऊँट हूँ' का राजस्थानी संस्करण (हूँ ऊण्ट हूँ)
3. केन्द्र का न्यूज लेटर (द्विभाषी)

A scene at camel fair,Bikaner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