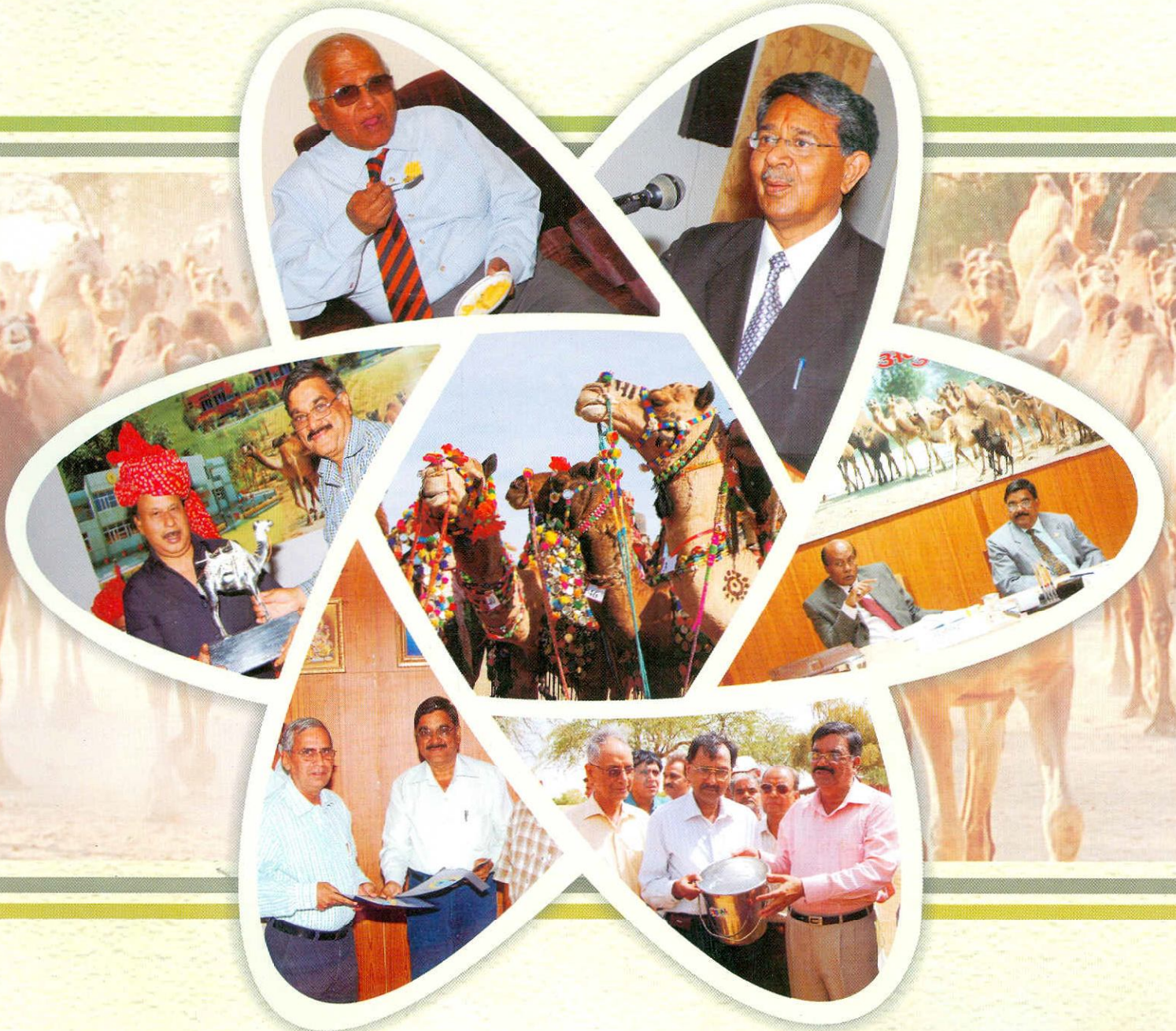




ANNUAL REPORT

2007-08

वार्षिक प्रतिवेदन



राष्ट्रीय उष्ट्र अनुसंधान केन्द्र

जोड़बीड, 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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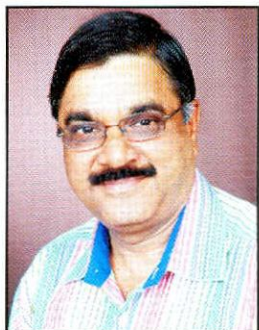
राष्ट्रीय उष्ट्र अनुसंधान केन्द्र
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CONTENTS

Preface	5
विशिष्ट सारांश	7
1. Executive Summary	11
2. Introduction	15
3. Research Achievements	19
4. Technology Assessed and Transferred	61
• 5. Education and Training, Awards	63
6. Linkages and Collaborations	65
• 7. List of Publications	67
• 8. List of Ongoing Research Projects	71
• 9. QRT, IMC, RAC, Management Committee and IRC	73
• 10. Participation in Conferences, Meetings, Workshops, Symposia and Trainings	77
• 11. Workshop, Seminar, Summer Institute and Brain Storming meet Organized, Visitors, Joining Transfer and Retirements	79
12. Personnel	81
13. Infrastructure Development	83

Preface



It gives me immense pleasure to present the Annual Report of National Research Centre on Camel (NRCC) for the year 2007-08. This is a comprehensive document highlighting the significant achievements of the institute in the area of camel breeding and genetics, physiology, biochemistry and reproduction, nutrition, health, management and extension, farming and agro-forestry.

The Centre made a modest beginning during the last phase of VI Plan as a Project Directorate on 5th July, 1984 which was upgraded to National Research Centre on Camel and came into existence on 20.09.1995. Initially, the Centre started with the mandates of developing infrastructure and basic facilities for research on camel which were relevant for conservation and preservation of existing breeds and generated base line data. With the implementation of research programmes the NRCC has become a unique, world famous premier research centre on camel and its speciality is further magnified on account of its importance as a renowned tourist attraction for the people visiting Bikaner, from across the globe. The research endeavor of the Centre in transforming camel into a milch animal have also contributed towards enhancement of its quality as tourist spot by way of offering camel milk based health drinks and ice-cream.

During the preceding year, our R&D efforts got further impetus through well defined and well structured research programmes. The sugar free kulfee from camel milk have been developed and sold at the milk parlour of the Centre. The cream prepared from the camel milk has been observed to be effective in moisturizing and glowing of the skin. Protein fractions from seminal plasma have been lyophilized and analyzed by SDS-PAGE. High potential of body

weight gain has been observed in camel calves fed on a diet with higher percentage of crude proteins. Dry matter intake improved in the camels fed on mineral mixture with their rations. Pox viral DNA was isolated from the skin scabs of camels exhibiting the symptoms of camelpox and PCR for the haemagglutinin gene of camelpox virus was carried out using the suitable primers.

I feel happy that the concerted efforts of all scientists could bring this report in the present form for which I express my sincere appreciation. The dedicated efforts made by the publication committee, In-charge PME Cell, technical and administrative staff in bringing out this publication are thankfully acknowledged. The Research Advisory Committee under the chairmanship of Dr. Nagendra Sharma, 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.

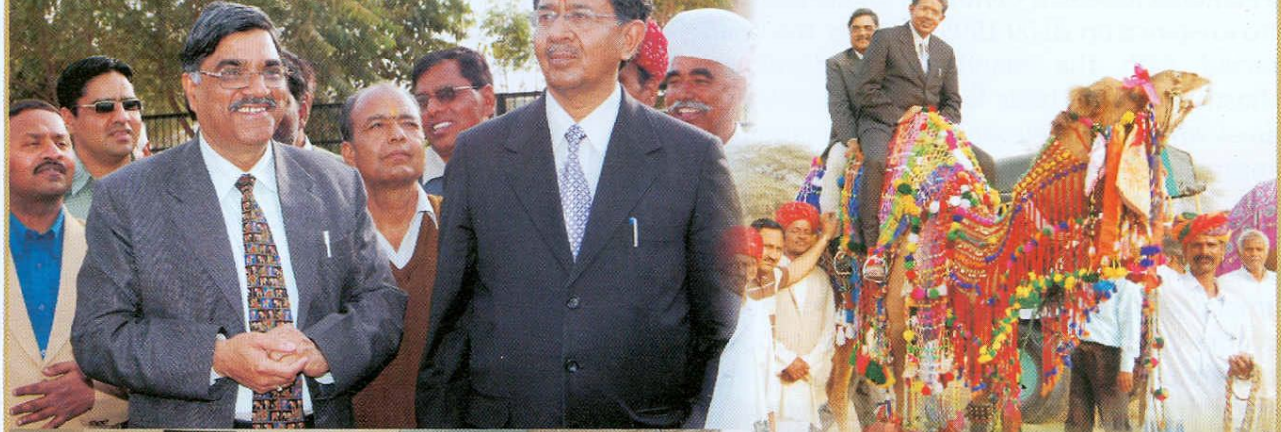
I express my sincere thanks to Dr. Mangla Rai, Secretary, DARE and the Director General, ICAR for his support and encouragement for the development of the Centre. I express my sincere gratitude to Dr. K. M. Bujarbaruah, DDG (AS) for his valuable guidance and magnanimous support for various activities of the Centre. I sincerely acknowledge the timely cooperation and help received from Dr. Lal Krishna, ADG (AH), Dr. C. S. Prasad, ADG (A N & P), Dr. T. J. Rasool, ADG (A P & B), Dr. Rajan Gupta, PS and Dr. Vineet Bhasin, PS.

I sincerely hope that this publication would serve its purpose as an annual progress report for the year 2007-08 and also as a valuable source of information to the professionals of the scientific institutions and other related organizations.



[Prof. K. M. L. Pathak]

Director



विशिष्ट सारांश

बीकानेरी, जैसलमेरी एवं कच्छी नस्ल के ऊँटों की शारीरिक भार वृद्धि तुलनात्मक दृष्टिकोण से संतोषजनक पाई गई। 2, 6 एवं 8 वर्ष की उम्र के समूह को छोड़कर विभिन्न नस्लों के भार में समानता पाई गई। ऊँटों में भार वृद्धि का कोई विशेष प्रभाव लिंग के कारण नहीं पाया गया। वातावरणीय कारकों का असर जन्म से तीन वर्ष तक प्रभावी रहा।

समग्र गर्भधारण दर 76.56 प्रतिशत तथा वत्स जनन दर 84.61 प्रतिशत रही। प्रथम गर्भधारण के समय उम्र 1709 ± 55 दिन रही तथा प्रथम वत्स जनन 2062 ± 60 दिन के बाद हुआ। प्रथम सात वत्स जनन अन्तरालों का अध्ययन किया गया जो कि 599 से 779 दिन रहा। प्रथम नौ गर्भकालों का अध्ययन किया गया एवं गर्भकाल 378 से 392 दिन पाया गया।

बीकानेर नस्ल के 5, जैसलमेरी नस्ल के 5 एवं कच्छी के 4 ऊँटों का चयन उनकी शरीर की लम्बाई के आधार पर उनकी भार वहन क्षमता में वृद्धि हेतु केन्द्र के ऊँटों में प्रजनन हेतु किया गया। मेवाड़ी नस्ल के दो वयस्क नर, 8 वयस्क मादा एवं एक बछड़ा नस्ल के प्रजनन क्षेत्र से कय कर अनुवांशिक सुधार एवं नस्ल संरक्षण हेतु केन्द्र पर लाया गया। दुग्ध क्षमता में सुधार करने के लिए 6 मादा बीकानेरी व 6 कच्छी नस्ल की ऊँटनियां चयनित की गईं। दो थनों का दूध बछड़े के लिए छोड़ते हुए बाकी दो थनों का दूध अभिलेखित किया गया। कच्छी नस्ल की एक मादा जो कि तीसरे ब्यांत में थी, उसका दूध सबसे अधिक 6 लीटर पाया गया। दूसरे स्थान पर एक अन्य कच्छी मादा का दूध 4.4 लीटर रहा जो कि चौथे ब्यांत में थी। सांख्यिकी विश्लेषण करने पर पता चलता है कि कच्छी नस्ल की मादाएं बीकानेरी नस्ल की मादाओं से दोपहर व शाम को एवं कुल दूध उत्पादन में श्रेष्ठ हैं। प्रातःकाल का दुग्ध उत्पादन दोपहर व शाम को निकाले गए दूध से अधिक था तथा पीछे के थनों से निकाला गया दूध आगे के थनों से निकाले गए दूध से अधिक था।

एल.सी.ए. श्रंखला के 10 युग्म जोड़े मंगवाए गए एवं उनके लिए पी.सी.आर. का मानकीकरण किया गया। एल.सी.ए. 22 के आकार में भिन्नता पाई गई तथा एल.सी.ए. 33 बहुरूपक पाया गया जिसमें 3 प्रकार के अलील थे जबकि एल.सी.ए. 68 एक प्रकारिय पाया गया।

बीकानेरी, जैसलमेरी एवं कच्छी नस्लों में ग्लोमेरुलर फिल्ट्रेशन दर की जाँच हेतु अंतर्जात क्रिएटिनीन अस्पर्शी अध्ययन किया गया। इन नस्लों में सीरम क्रिएटिनीन एवं यूरिया नाइट्रोजन

: सीरम क्रिएटिनीन में महत्वपूर्ण भिन्नता थी जो विभिन्न आयु वर्गों में नहीं पाई गई। विभिन्न आयु वर्ग के समूहों में सीरम यूरिया नाइट्रोजन भिन्न-भिन्न ($P < 0.05$) पाई गई। सीरम क्रिएटिनीन नर ऊँटों में सार्थक रूप से अधिक ($P < 0.05$) था। ऊँटों में विसर्जित मूत्र की मात्रा में बहुत अधिक भिन्नता पाई गई।

इम्यूनो रेडियो मेट्रिक एसे तकनीकी आधारित रोग निदान किट प्रयोग में लाई गई परंतु उष्ट्र ल्युटिनाइजिंग हारमोन (एल.एच.) की जाँच परिमाण हेतु उपयुक्त नहीं पाई गई।

गर्भ निदान हेतु पारंपरिक पूँछ उठाने के व्यवहार एवं संसर्ग के 14-15 दिन पश्चात सीरम प्रोजेस्टीरोन सांद्रता जाँचने का तुलनात्मक अध्ययन किया गया। ऊँटों के समूह में प्रजनन प्रबन्धन हेतु पूँछ उठाने के व्यवहार से अगर्भित मादाओं की पहचान आरम्भ में ही की जा सकती है। यद्यपि इसके लिए साप्ताहिक आधार पर बार-बार पूँछ उठाने के संकेत की जांच करनी चाहिए ताकि असत्य गर्भित एवं भ्रूणीय हास के कारण हुई रिक्तता का पता चल सके।

शीघ्र मद या मस्ती में आने वाले नर ऊँटों में सीरम टेस्टोस्टीरोन सांद्रता आरम्भ से ही अधिक पाई गई जबकि देरी से मद में आने पर ऐसा नहीं हुआ। मस्ती दर्शाने वाले नर ऊँटों की टेस्टोस्टीरोन सांद्रता, मस्ती में नहीं आने वाले ऊँटों की अपेक्षा सार्थक रूप से अधिक पाई गई।

केन्द्र में विद्युत उत्पादन एवं कृषि प्रसंस्करण इकाई संस्थापित की गई जिस पर ऊँटों को अपनी क्षमता से संचालन हेतु प्रशिक्षित किया गया है। पशुओं द्वारा कार्य करते समय शरीर कार्यािकी परिवर्तनों के अभिलेख रखने के लिए पॉलीग्राफ मशीन का उपयोग किया जा रहा है।

स्कंदन हेतु सिट्रिक अम्ल एवं कैल्शियम क्लोराइड प्रयुक्त करते हुए उष्ट्र दूध से पनीर तैयार किया गया। 0.5-1.0 प्रतिशत साइट्रिक अम्ल तथा 0.1 प्रतिशत - 0.2 प्रतिशत कैल्शियम क्लोराइड मिलाने से अच्छी गुणवत्ता युक्त पनीर की 9 - 10 प्रतिशत तक मात्रा प्राप्त होती है। इस प्रकार तैयार पनीर में नमी एवं वसा तत्व क्रमशः 51.24, 5.21 एवं 18.52, 3.40 प्रतिशत थे। केन्द्र द्वारा उष्ट्र दुग्ध निर्मित चॉकलेट एवं शर्करा-मुक्त कुल्फी विकसित की गई एवं ये उत्पाद केन्द्र के मिल्क पार्लर पर बिक्री हेतु उपलब्ध करवाए गए हैं।

केन्द्र द्वारा तैयार उष्ट्र दुग्ध निर्मित क्रीम त्वचा में

गीलापन बनाए रखने हेतु उपयोग में लाई जा सकती है। इस विषय में तीन माह तक चले अध्ययन में पाया गया कि इस क्रीम के उपयोग से त्वचा चमकीली तथा नमीयुक्त हो जाती है।

ऊँट और गाय दूध दहे के प्रोटीनों में गुण-परिवर्तन भिन्न-2 तापक्रमों पर किया गया। बीकानेरी, जैसलमेरी और कच्छी ऊँटों एवं गाय के दूध में दहे प्रोटीनों की मात्रा क्रमशः 0.90 ± 0.04 , 1.31 ± 0.01 , 0.95 ± 0.03 एवं 0.44 ± 0.03 प्रतिशत पाई गई। बीकानेरी, जैसलमेरी और कच्छी ऊँटों एवं गाय के उबले हुए दूध में औसतन दहे प्रोटीन्स की मात्रा क्रमशः 0.28 ± 0.01 , 0.81 ± 0.02 , 0.35 ± 0.02 , 0.07 ± 0.01 प्रतिशत रही।

प्रथम गर्भ धारण दर एवं समग्र गर्भ धारण दर जैसलमेरी एवं कच्छी ऊँटों की तुलना में बीकानेरी नस्ल में अधिक पाई गई। इसी प्रकार बीकानेरी ऊँटों में जनन बन्ध्यता दर, जैसलमेरी एवं कच्छी नस्ल की तुलना में कम आंकी गई।

जब पुटक विद्यमानता की पुष्टि के बाद संसर्ग करवाया गया तो एकल सर्विस की तुलना में बार-बार सर्विस देने का गर्भ दर पर कोई लाभदायक प्रभाव नहीं पाया गया। ऊँटों में गर्भ दर वीर्य स्खलन के समय से प्रभावित नहीं होती। बधिया किए गए ऊँट से मादा ऊँटनी का संसर्ग करवाने के पश्चात् जब इनका ताजा एकत्रित वीर्य से सेचन किया गया तो इनमें गर्भधारण नहीं हो पाया।

उष्ट्र वीर्य प्लाज्मा में उच्च आण्विक भार वाले प्रोटीन पाए गए। ये प्रोटीन 41 घण्टे के बाद वीर्य में तरलता होने पर विलुप्त होने लगते हैं। सजातीय वर्ण लेखिकी द्वारा विभिन्न वीर्य प्लाज्मा प्रोटीनों को पृथक करने हेतु प्रयास किए गए। यूरिया एवं नमक के विभिन्न सांद्रणों द्वारा परिवंध प्रोटीनों को पृथक किया गया। प्रोटीन अंशों का पाउडर बनाकर एस.डी.एस.-पॉलिएक्रिलामाइड जैल इलैक्ट्रो-फॉरेसिस द्वारा विश्लेषण किया गया परन्तु परिवंध प्रोटीनों को पृथक करने में कोई सफलता नहीं मिली।

जननांग परीक्षण के बिना प्रसव के 50 से 70 दिनों बाद अथवा 30 मार्च से पहले गर्भित नहीं होने पर 18 प्रसवोत्तर ऊँटनियों में संसर्ग करवाया गया। इस प्रकार छः गर्भित मादाओं को परीक्षणोपरांत गर्भित पाया गया जिससे इनमें पारंपरिक प्रणाली द्वारा संसर्गित ऊँटनियों की तुलना में लगभग 300 दिनों की ब्यांत अंतराल अवधि में कमी हुई है।

एक वर्षीय उष्ट्र बछड़ों के शारीरिक भार में वृद्धि की सम्भाव्यता अधिक मात्रा में रूक्ष प्रोटीन युक्त आहार देने पर अधिक पाई गई।

भूसा आहार के अन्तर्गत मोठ चारे की पचनीयता सर्वाधिक (53.75 प्रतिशत) आंकी गई एवं चना भूसे में न्यूनतम (40.80 प्रतिशत) आंकी गई। नीम की पत्तियों में पात्रे शुष्क पदार्थ पचनीयता सर्वोच्च (50.48 प्रतिशत) एवं शीशम की पत्तियों में न्यूनतम (31.1 प्रतिशत) थी। जबकि लाणा एवं गांठिया घास में पात्रे शुष्क पदार्थ पचनीयता क्रमशः 50.0 व 21.74 प्रतिशत थी। झाड़ियों के वर्ग में पात्रे शुष्क पदार्थ पचनीयता 29.73 प्रतिशत (फोग) तथा 37.90 प्रतिशत (पाला) में थी।

फलीदार भूसा (क्लस्टर बीन) खिलाने के पहले एवं खिलाने के 4 व 8 घंटे बाद रुमेन तरल पदार्थ संबंधी आंकड़े लिए गए जिनमें 8 घंटे पश्चात् पीएच में प्रभावी कमी पाई गई जबकि सकल वाष्पीय वसा अम्लों एवं ट्राईक्लोरोएसीटिक अम्ल द्वारा प्रक्षेपित नाइट्रोजन में समवर्ती वृद्धि देखी गई।

फलीदार भूसा खिलाने के 0, 4 एवं 8 घंटों बाद ऐसीटिक, प्रोपिऑनिक तथा ब्यूटाइरिक अम्ल की मात्रा क्रमशः 57.84-61.26, 22.22-27.21 व 14.08-88 अणुक प्रतिशत पाई गई।

राजस्थान के अर्द्ध शुष्क पश्चिमी भागों में भिन्न-2 कृषीय जलवायु क्षेत्रों के सूक्ष्म पोषक तत्वों का निर्धारण करने के पश्चात् क्षेत्र विशिष्ट खनिज मिश्रण तैयार किए गए। जिन पशुओं को खनिज मिश्रण दिया गया उनमें शुष्क पदार्थ अन्तर्ग्रहण प्रतिक्रियाओं उपापचय शारीरिक भार (ग्रा/किग्रा.^{0.75}) युक्त मिश्रण नहीं खिलाए जाने वाले जानवरों की अपेक्षा सार्थक रूप से अधिक (पी < 0.05) था। गत वर्ष पर्याप्त फलीदार भूसा, सांद्र (कंसेन्ट्रेट) तथा तैयार किए गए खनिज मिश्रण 50 ग्राम प्रति ऊँट प्रतिदिन 180 दिन तक खिलाया गया जिससे 6 ऊँटनियां गर्भित हो गईं।

चार एक दिवसीय शिविरों में विभिन्न प्रकार के नमूने एकत्रित किए गए तथा उनके जीवाणु विश्लेषण से स्टेफाइलोकॉकस, कारइनीबैक्टीरीय, बैसीलस, स्यूडोमोनास जैसे जीवाणु पाए गए।

28 ऊँटों के त्वचा खुरचन से चेचक विषाणु डीएनए पृथक किया गया। उष्ट्र चेचक विषाणु के रक्त समूहन जीन के लिए उष्ट्र चेचक एवं पीसीआर के लक्षण प्रदर्शित करते हुए पता लगाया गया। इस हेतु निम्नांकित प्राइमर सेट काम में लिए गए। एम्प्लीकॉन, P^{ET32(A)} विक्टर के साइट BamH1 एवं xho I पर अनुवर्ती क्लोन किए गए तथा ई. कोलाई में प्रकट हुए। पीसीआर प्रतिक्रिया हेतु आप्टीमल एमजी 2+ सांद्रण एवं प्राइमर युग्मन तापक्रम क्रमशः 1.5 एमएम एवं 50° से. थे। 948 आधार युग्म आकार का एम्प्लीकॉन एगरोज जेल में देखा गया। अनुमान हेतु प्रयुक्त आइसो प्रोपाइल बीटा-डीथायोग्लेक्टो पाइरनो साइड का

सांद्रण 1 मिली मोलर था।

उत्प्रेरित जीवाणु कोशिकाओं जिनमें कि रिक्मबीनेंट प्लाज्मिड थे, उनका एस.डी.एस. पेज से विश्लेषण करने पर 53 किलो डाल्टन आकार का प्रोटीन देखा गया।

चरणबद्ध मरु पौधों की जांच की गई। उनमें से कुछ जैसे गिलोई, तुलसी, बबूल इत्यादि का जीवाणुओं की वृद्धि पर विपरीत असर देखा गया।

अनार और परदेशी कीकर का कच्चा एवं मेथेनल एक्सट्रेक्ट जीवाणु पृथक्करण में शत प्रतिशत प्रभाव रहा। धतूरा, अश्वगंधा एवं लहसुन प्रति जीवाणवीय प्रक्रिया भली-भाँति करते पाए गए। कीकर में प्रति कवकीय गतिविधि अधिकतम प्रदर्शित हुई उसके बाद अनार एवं लहसुन में। प्रदर्शन में कीकर और अनार की परा बैंगनी किरणों से प्रति जीवाणु क्रिया प्रभावित नहीं हुई जबकि अन्य सभी पौधे कोई भी प्रति जीवाणु क्रिया प्रदर्शित करने में असफल रहे। अनार एवं परदेशी कीकर की पत्तियों एवं लहसुन की गांठ में हल्की प्रति कवकीय गतिविधि सहित स्थूल क्रम प्रति जीवाणु क्रिया पाई गई। दूसरी ओर धतूरा एवं अश्वगंधा पत्तियाँ ग्राम पोजीटिव जीवाणु में प्रभावी पाई गई।

विभिन्न रंगों के साथ रंगे गए सामान्य रुमेन द्रव नमूनें रुमिनोकोकस, एकल व दोहरे में ग्राम सकारात्मक कोकोइड, रुमिनोकोकस, फ्लेव फैशियस, दोहरे एवं एवं श्रंखला में ग्राम पोजीटिव कोकोइड, सेलिमोनस मोनियन, क्लस्टरर्स में ग्राम पोजीटिव राइस एवं ग्राम पोजीटिव जीवाणु प्रदर्शित करते हैं।

कुल 18 उष्ट्र दुग्ध नमूनें लेते हुए उच्च गतिकी अपकेन्द्रण के द्वारा दूध से पानी अलग किया गया तथा एकल किरण सदृश प्रतिरक्षाव्यापन को प्रयुक्त करते हुए उष्ट्र व्हे इम्यूनोग्लोबुलिन (आई.जी.) का परिमाणन किया गया। कॉलेस्ट्रॉल/दूध व्हे प्रतिरक्षाग्लोबुलिन की मात्रा यह प्रकट करती है कि आई जी मात्रा प्रसव में शून्य अवधि पर 17.72 ± 0.56 मि.ली.ग्रा./मि.ली. एवं प्रसव के उस दिन के बाद इसकी मात्रा कम होकर 3.89 ± 0.49 मि.ली.ग्रा./मि.ली. हो जाती है। गर्भित ऊँटनियों को प्रतिरक्षा प्रतिरूपक (रेस्टोबल-डाबर) खिलाने के बाद कोई उल्लेखनीय परिवर्तन या सुधार नहीं पाया गया।

घनत्व प्रवणता के द्वारा परिधीय रक्त एक केन्द्रक कोशिकाओं का अलगाव उतकपेक्यू प्रयुक्त करते हुए किया गया। आरपीएमआई माध्यम में पीबीएमसीएस का संवर्धनिक एवं कॉनकेनलिन 'ए' द्वारा पीबीएमसीएस का उद्दीपन मानकीकृत किया गया। ट्राइजोन अभिकारक प्रयुक्त करते हुए उद्दीपन कोशिकाओं से कुल आरएनए अलगाव एवं इंटरफेरॉन गामा जीन

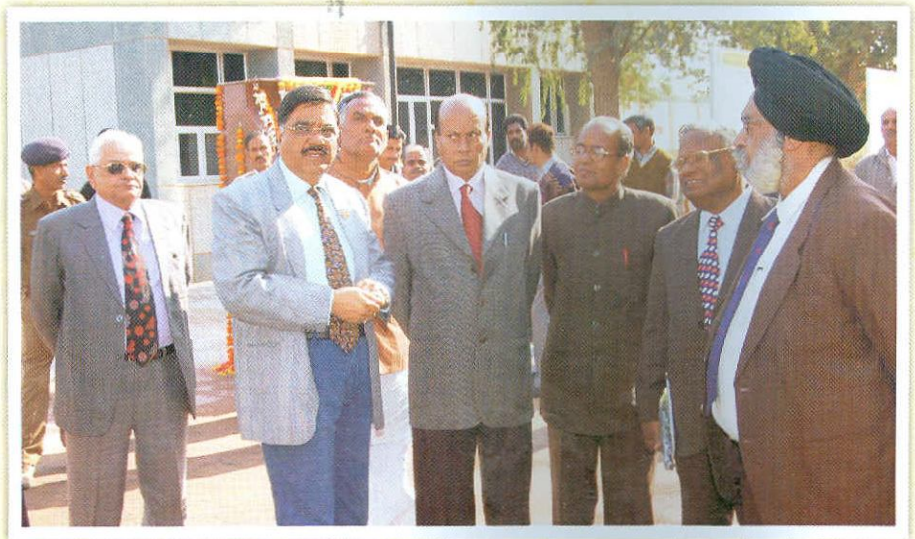
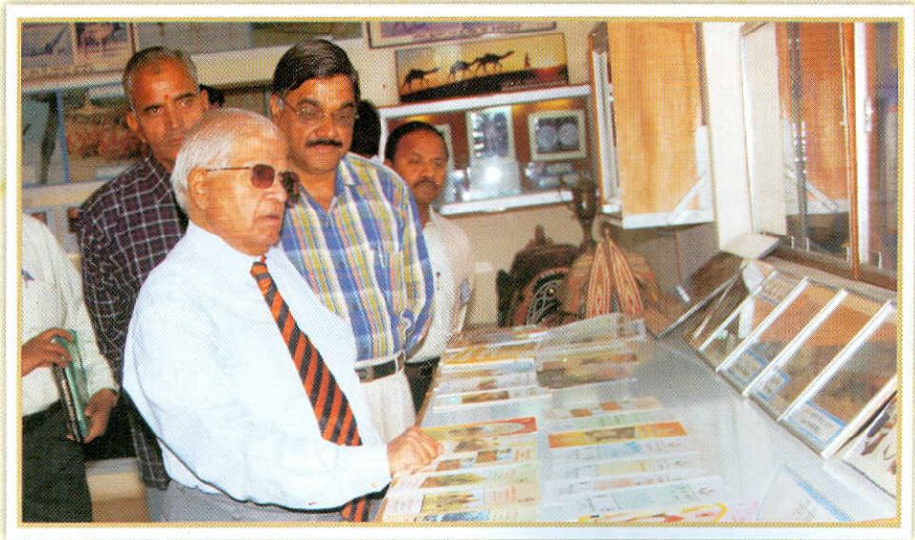
से रिवर्स ट्रान्सक्रिप्शन हेतु कुछ प्राइमर सेट प्रयुक्त किए गए। इनसे यह प्रदर्शित होता है कि विभिन्न साइटोकाइन जीन एक्सप्रेशन के लिए उष्ट्र परिधीय रक्त मोनोक्लीयर कोशिकाओं के उद्दीपन के लिए कोन ए 5 माइक्रोग्राम/मि.ली. सकेन्द्रण पर अनुकूलतम पाया गया। पीसीआर रिएक्शन हेतु इष्टतम मि.ली. ग्राम²⁺ सकेन्द्रण एव प्राइमर युग्मन तापक्रम क्रमशः 1.5 एम.एम एवं 49°C थे। एग्रोज जेल में 560 आधार युग्म के आकार का एम्पलीकॉन देखा गया।

उष्ट्र प्रबन्धन की भिन्न-भिन्न पालन पद्धतियों पर अध्ययन किया गया। यह प्रकट हुआ है कि अर्द्ध गहन प्रबन्धन (122.80 कि.ग्रा.) में उष्ट्र बच्चों में 365 दिनों के बाद कुल शारीरिक भार वृद्धि की प्राप्ति का तुलनात्मक औसत गहन प्रबन्धन (92.70 कि.ग्रा.) की अपेक्षा उच्च पाया गया। दोनों प्रकार की प्रबन्धन पद्धतियों में औसतन वृद्धि दर में सार्थक रूप से भिन्नता देखी गई।

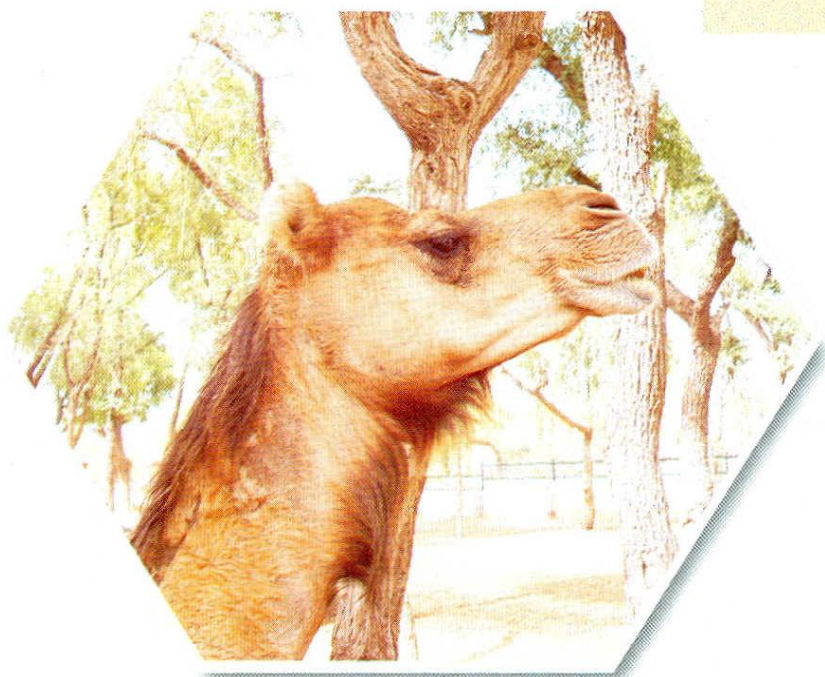
बीकानेर जिले के 11 गांवों में उष्ट्र पालन संबंधी समाजार्थिक पहलुओं का अध्ययन किया गया। देखा गया कि 174 उष्ट्र पालकों में से 30 साक्षर, 34 कार्यसाधक साक्षर एवं 36 प्रतिशत अशिक्षित थे। उनमें उष्ट्र स्वामी के रूप में 72.42 प्रतिशत थे परन्तु 27.58 ने उष्ट्र व्यापारी के रूप में अपनी पहचान बताई। बीकानेर जिले के विभिन्न गांवों में तीन स्वास्थ्य शिविरों का आयोजन किया गया। इन शिविरों में 196 ऊँटों एवं 600 भेड़ों का उपचार किया गया।

दो वैज्ञानिक प्रदर्शनियां आयोजित की गईं जिनमें एक 'उष्ट्र उत्पाद एवं तकनीकी' दिनांक 22.1.08 को बीकानेर में तथा दूसरी मूल्य संधित उत्पादों तथा तकनीकी की उपयोगिता दिनांक 13.02.2008 को रामदेव उष्ट्र मेला नागौर में लगाई गई। किसानों के विभिन्न समूहों को दिए गए तकनीकी प्रदर्शन एवं प्रशिक्षण में एनजीओएलपीपी, सादड़ी के 23 किसानों को दिनांक 14.03.2008 को, गैर सरकारी संगठन लोकहित पशुपालक प्रन्यास, जोधपुर में दिनांक 3.5.2007 को 40 किसानों को दिनांक 13-15 सित. 07, एनजीओ रक्षक प्रोजेक्ट, जोधपुर के 190 किसानों को दिनांक 17.11.2008 को कृषि किसान कल्याण एवं विकास, उज्जैन, एम.पी. के दिनांक 13-14 मार्च के दौरान 19 किसान शामिल हुए।

तीन किसान सम्पर्क व किसान गोष्ठी मेघासर, करणी सिंह स्टेडियम एवं एनआरसीसी में आयोजन के दौरान उष्ट्र पालकों को ऊँटों में होने वाले नए रोगों व संगठित फार्म में आधुनिक प्रबन्ध पद्धति के बारे में बताया गया।



1



Executive Summary

The growth of Bikaneri, Jaisalmeri and Kachchhi breeds of Indian dromedary was good. The analysis of variance indicated that the effect of breed was non-significant ($P>0.05$) except at 2, 6 and 8 years of age. The effect of sex was non-significant throughout the growth phase whereas the effect of non-genetic factor year was significant from birth to 3 years of age. The overall conception was 76.56% and the calving was 84.61%. The age at first conception was 1709 ± 55 days and the age at first calving was 2062 ± 60 days. The calving interval from first calving interval to 7th calving interval was analysed for the effect of breed using leastsquares analysis of variance by Harvey. The average values ranged from 599 to 779 days. The length of gestation was also analysed from 1st to 9th gestation. The average gestation length ranged from 378 to 392 days.

Five studs of Bikaneri, 5 of Jaisalmeri and 4 of Kachchhi breed were selected mainly on the basis of body length and following independent culling level for

the other two traits for breeding the centre's she camels under the project on the improvement of draughtability of camel breeds.

Two breeding males, 8 females and a calf of Mewari breed has been introduced in the Centre's herd for genetic improvement of the breed and to preserve this germplasm at the Centre. For the improvement of milk production potential 6 females each of the Bikaneri and Kachchhi breed were selected. Two teat milking was followed to allow proper let down of milk. The highest milk production (6075 ml) was of K-117, which was in 3rd parity followed by 4393 ml in K-83, which was in 4th lactation. The leastsquares analysis of variance indicated that the Kachchhi females were superior to Bikaneri in noon, evening and total milk production. The production in morning was higher as compared to noon and evening and the production from rear teat was greater than front teat during all the times of milking.

Ten primers of LCA series were procured and



the PCR conditions were standardized. In LCA 22 size variation was observed. LCA 33 was observed to be polymorphic with 3 alleles where as the LCA 68 was monomorphic.

Endogenous Creatinine Clearance study to measure glomerular filtration rate was conducted on 18 male camels six from each of three breeds of camel viz. Bikaneri, Jaisalmeri and Kachchi. The values of serum creatinine (SC) and serum urea nitrogen/ serum creatinine (SUN/SC) ratio differ significantly ($P < 0.05$) between breeds but not in different age groups, while those of serum urea nitrogen differ ($P > 0.05$) between different age groups but not in different breeds. Serum creatinine was significantly higher in male ($P < 0.05$), while SUN and SUN/SC ratio was significantly higher in females. Urine output is highly variable parameter in camel.

An IRMA technique based diagnostic kit was tried but found not suitable for quantitation of cameline LH. The comparison of traditional tail curling test and serum progesterone concentration measured on day 14-15 post mating for diagnosis of pregnancy revealed that tail curling test is effective in early detection of non-pregnant females for breeding management of the herd. However, repeated tail tests on weekly basis are required to detect false positive and those emptied due to early embryonic deaths. Early rutting male camels were observed to have an early rise in serum testosterone concentration than late rutting and testosterone concentration was significantly high in rutting males ($P < 0.01$) compared to non-rutting.

The electric generation and agro-processing unit has been installed and the animals are being trained to run this machine efficiently. The animals have been trained for carrying out draughtability studies under the project. A polygraph machine has been procured to record the physiological changes while working.

Paneer was prepared from the camel milk by using citric acid and CaCl_2 for the coagulation. 0.5-1.0% citric acid along with 0.1-0.2% CaCl_2 yields a good quality paneer with a recovery of 9-10%. The moisture and fat content in paneer were $51.24 \pm 5.21\%$ and $18.52 \pm 3.40\%$, respectively. Camel milk chocolate and sugar-free kulfee were developed and sold through centre's camel milk parlour.

Camel milk cream prepared by the centre can

be used as a moisturizing cream. This was concluded on the basis of open pilot study that was conducted in 25 test group patients and 25 control group patients for 3 months. Moisturizing effect with glowing/ shining of skin was observed after using the camel milk skin cream. Similar findings were also observed in control group.

Denaturation of camel and cow milk whey proteins varied at different temperatures. Average whey proteins concentration in raw milk were observed to be 0.90 ± 0.04 , 1.31 ± 0.01 , 0.95 ± 0.03 and 0.44 ± 0.03 per cent respectively in Bikaneri, Jaisalmeri and Kachchi camels and cow. Average whey proteins concentration in boiled milk was observed to be 0.28 ± 0.01 , 0.81 ± 0.02 , 0.35 ± 0.02 , 0.07 ± 0.01 percent, respectively in Bikaneri, Jaisalmeri and Kachchi camels and cow.

First service conception rate and overall conception rate were observed to be higher in Bikaneri breed than Jaisalmeri and Kachchi. Similarly, infertility rate was low in Bikaneri than Jaisalmeri and Kachchi. When matings were given after ascertaining follicular presence, repeated services had no beneficial effects over single service on pregnancy rate. It was revealed that that pregnancy rate is not affected by copulation time. The female camels mated with the vasectomised teaser, followed by insemination with freshly collected semen failed to conceive.

Higher molecular weight proteins were found to present in fresh seminal plasma and aliquots taken at different time intervals. Higher molecular weight seminal plasma proteins could remain stable up to 41 h with individual variations and after that these proteins start to degrade as the camel semen starts to liquefy. Efforts were made to isolate the seminal plasma proteins by affinity chromatography. The bound proteins were eluted with different concentrations of Urea and NaCl. Protein fractions were lyophilized and were analyzed by SDS-PAGE. Bound proteins could not be successfully eluted.

Eighteen post-parturient camels were mated without genital examination (and 50 and 70 days of parturition when found non-pregnant before 30th March). Six females tentatively diagnosed as pregnant resulting in reduction of around 300 days of inter-calving period in each of these six females as compared to female camels subjected to traditional system of mating.

Higher potential of body weight gain (436 g/d) was observed in yearling camel calves fed with the diet



containing 14.50% crude protein in comparison to diet containing 9.5% and 12.09% crude protein. Among straws, highest digestibility was recorded in moth straw (53.75%) and lowest in gram straw (40.88%) whereas, in tree leaves, neem (50.48%) had highest IVDMD and sesame (31.1%) had lowest. In grasses, lana had 50.0% IVDMD and ganthia had lowest IVDMD 21.74%. The IVDMD of shrubs and bushes ranged from 29.73% in phog to 37.90% in pala.

Studies with rumen liquor collected before and after 4 and 8 h of feeding of cluster bean straw showed significant ($p < 0.01$) decrease in pH from 7.19 at 0 hr to 6.38 at 8 hr with concurrent increase in TVFA and TCA ppt N. Molar percent of acetic acid, propionic acid and butyric acid with clusterbean straw varied from 57.84-61.26, 22.22-27.21 & 14.08-16.88 respectively at 0, 4 & 8 hrs.

After assessing the micronutrient deficiency in different agro-climatic zones of semi arid western regions of Rajasthan, area specific mineral mixture was formulated. Dry matter intake as per kg metabolic body weight ($\text{g}/\text{kg}^{0.75}$) was significantly ($p < 0.05$) higher in animals fed mineral mixture than those not fed. Eight camels failed to conceive in previous year were fed clusterbean straw *ad lib* and concentrate mixture and formulated mineral mixture @ 50 g/camel/d for 180 days. Six camels conceived.

Bacterial isolates viz. *Staph. aureus*, *Staph. epidermidis*, *Corynebacterium spp.*, *Bacillus spp.*, *Pseudomonas spp.*, Yeast were observed in various samples collected from the camels attended in the four one day camps organised in Bikaner, Hanumangarh, Nagaur and Barmer.

Pox viral DNA was isolated from the skin scabs of 28 camels exhibiting the symptoms of camel pox and PCR for the haemagglutinin gene of camel pox virus was carried out using the following set of primers. The amplicon was subsequently cloned at *Bam*HI and *Xho*I sites of $P_{ET}^{32(A)}$ vector and expressed in *E. coli*. Optimal Mg^{+2} concentration and primer annealing temperature for the PCR reaction were 1.5 mM and 50°C, respectively. An amplicon of size 948 bp was seen in agarose gels. The concentration of IPTG used for the induction was 1 mM.

About 53 kDa sized protein was observed in the SDS-PAGE analysis of the lysate from the induced

bacterial cells harbouring recombinant plasmids.

A series of desert plants were screened in phases. Few among them viz. Giloi, Tulsi, babool etc. were suggestive of their desired inhibitory effect on propagation of organism.

Crude and methanol extracts of anar and pardesi Kikar were 100% effective against six bacterial isolates (3 *Staph. aureus*, 2 *E. coli* and 1 *Pseudomonas spp.*). Datura, Ashawagandha and Garlic were found to possess good antibacterial activity. Maximum antifungal activity was exhibited by Kikar followed by Anar and Garlic. On exposure to UV rays antibacterial activity of Kikar and Anar was not affected whereas all other plants failed to show any antibacterial activity. Broad spectrum antibacterial activity along with mild antifungal activity was observed with Anar and pardesi Kikar leaves and garlic bulb. Whereas Datura and Ashwagandha leaves were found effective against G +ve bacteria.

The normal rumen fluid samples stained with different stains revealed *Ruminococcus albus*, a gram positive coccoid in singles and two's; *Ruminococcus flavefaciens*, a gram positive coccoid in two's and chains; *Selenomonas ruminantium*, a gram positive rods and certain gram positive bacteria in clusters.

In a total of 18 camel milk/colostrum samples, whey was separated by high-speed centrifugation and the estimation of camel whey Ig's was carried out using single radial immunodiffusion. The results of colostrum/milk whey immunoglobulins revealed that Ig conc. declined from 17.72 ± 0.56 (at 0 h) to 3.89 ± 0.49 of the parturition. No significant change or improvement in what was found after feeding of immunomodulator (Restobal- Dabur) in pregnant camels.

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 Interferon-Gamma gene using the following set of primer was attempted. It was revealed that Con A at the concentration of 5 $\mu\text{g}/\text{ml}$ was found to be optimum for the stimulation of cameline peripheral blood mononuclear cells for the various cytokine gene expression. Optimal Mg^{+2} concentration and primer annealing temperature for the PCR reaction were 1.5



mM and 49°C, respectively. An amplicon of size 560 bp was seen in agarose gels.

Studies on camel rearing practices in different system of management revealed that the comparative average total body weight gain in camel calves (17-21 months) was higher in semi-intensive management (122.80 kg) than intensive management (92.70 kg) after 365 days. The average growth rate significantly ($P<0.01$) varied between groups for both types of management practices.

Socio-economic aspects of camel husbandry was studied in eleven villages of Bikaner district. It was revealed that out of 174 camel keepers 30, 34 and 36 percents were literate, functionally literate and illiterate, respectively. Most of respondents were camel keepers (72.42 %) whereas 27.58 % of respondents were camel merchants.

Three health camps were organised in different villages of Bikaner district. A total of 196 camels and 600

sheeps were treated in these camps.

Two scientific exhibitions were organised on different themes. "Camel products and technology" at Bikaner and "Utilization of value added products and technology" at Ramdev Camel Fair, Nagour.

The demonstrations / practical trainings were provided to various groups of farmers viz. 23 farmers from NGO L.P.P.S, Sadri, Pali, 40 farmers from M.H.S.C TRUST, Jodhpur, 30 farmers from Krishi Vistar, Jhunjunu, 190 farmers from NGO Desura Dashak Project, Bap, Jodhpur, 19 farmers from Krishi kisan Kalian & Krishi Vikas, Ujjain, M.P.

Three farmer's meet / kisan gosthies were conducted at Meghasar village, at Karni Singh Stadium and at NRCC, Bikaner. During the gosthi, camel keepers were apprised of the advancement in diagnosis of camel diseases and modern management practices followed at an organized farm.





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 utilising 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.

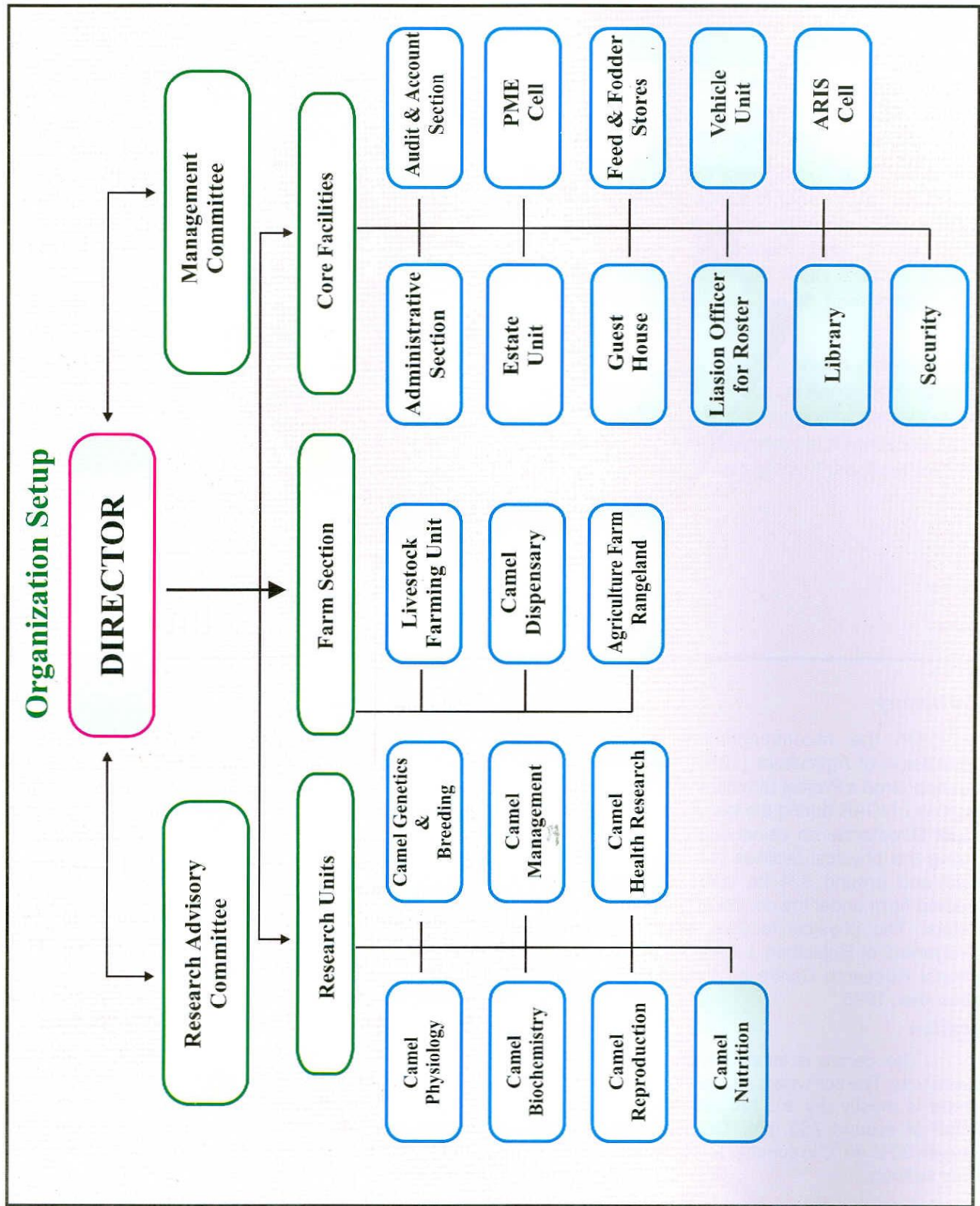
Mandate

The centre was started with mandates of developing infrastructure and basic facilities for research on camel which were relevant for conservation and preservation of existing breeds of camel and generated 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, camel physiology, camel biochemistry, camel reproduction, camel health, camel nutrition, camel management and extension, camel farming and agro-forestry units and ARIS and PME cells.





Infrastructure

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

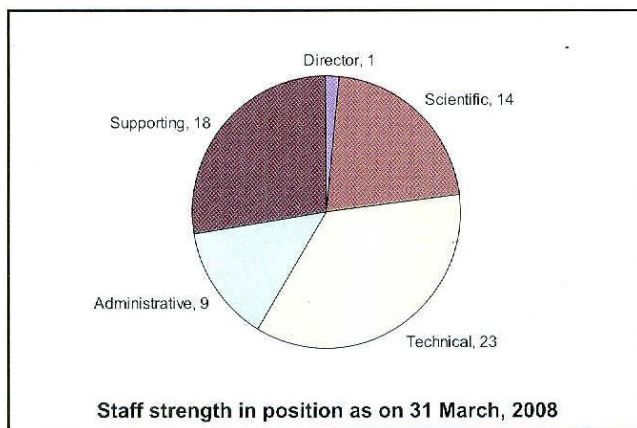
The NRCC has modern laboratories situated in three complexes. The laboratories are fully equipped to handle modern research in the field of camel physiology, reproduction, biochemistry, genetics and breeding, camel health, nutrition, pathology and management.

The centre maintains an elite herd of about 270 camels comprising of Bikaneri, Jaisalmeri, Mewari and 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 30 Indian and 10 foreign journals and has collection of 6742 reference books.

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 like flavoured milk, kulfee, tea and coffee to the tourists.

Staff position (as on 31st March, 2008)

Cadre	Number of posts sanctioned	Number of post filled*
Director	1	1
Scientific	20	14
Technical	23	23
Administrative	10	9
Supporting	19	18
Total	73	65

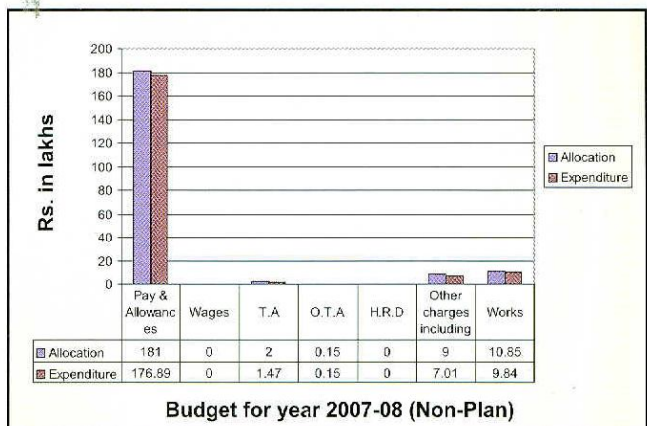
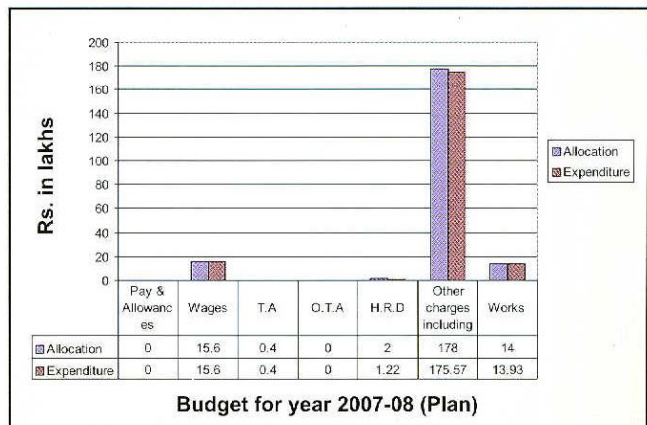


Financial statement (2007-08)

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:

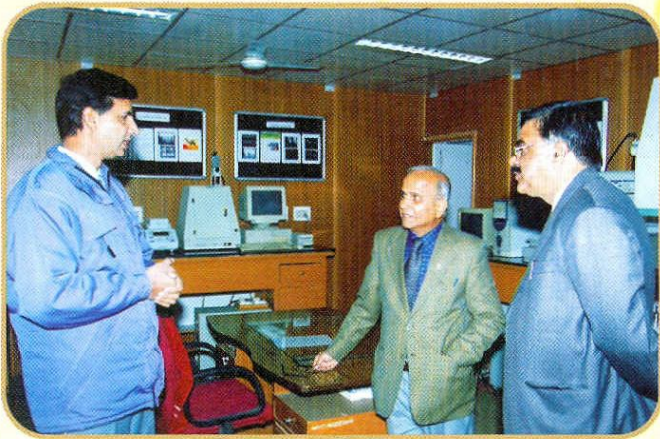
(Rs. In Lakh)

Head of Account	Allocation		Expenditure	
	Plan	Non Plan	Plan	Non Plan
Pay & Allowances	-	181.00	-	176.89
Wages	15.60	-	15.60	-
T.A.	0.40	2.00	0.40	1.47
O.T.A.	-	0.15	-	0.15
H.R.D.	2.00	-	1.22	-
Other charges including Equipment	178.00	9.00	175.57	7.01
Works	14.00	10.85	13.93	9.84
Total	210.00	203.00	206.72	195.36
Revenue receipt	16.32			



Revenue receipt/ generation (2007-08): Rs. 16.32 Lakhs







Research Achievements

The research targets set by the centre and discussed in the Research Advisory Committee (RAC) and Institute Research Committee (IRC) meeting were implemented by seven units of the Centre

Unit: Camel Genetics and Breeding

Project : Studies on qualitative and quantitative genetic parameters in Indian Camel

Project Leader : Dr. S.C.Mehta

Associate : Dr. U.K.Bissa

Body weight and growth

The growth data was analysed for the year 2001 to 2008 for Bikaneri, Jaisalmeri and Kachchhi breeds of Indian dromedary. The over all growth has been good enough and quite comparable with the previous results. The effect of breed was non-significant ($P>0.05$) except at 2, 6 and 8 years of age. The effect of sex was non-significant throughout the growth phase. The effect of

non-genetic factor year was significant from birth to 3 years of age (Table 1 and 2).

Reproductive parameters

The reproductive performance of the centre's camel herd was good. The over all conception rate was 76.56% which was quite comparable with the last year's conception rate which was 76.47%. The calving (84.61%) was also comparable with the previous five years herd performance (Table 3). The age at first conception, age at first calving and the calving intervals from first calving interval to 7th calving interval was analysed for the effect of breed using leastsquares analysis of variance by Harvey. The results are presented in Table 4. The length of gestation was also analysed from 1st to 9th gestation. The results are presented in Table 5.

Mortality at NRCC herd

The age-wise, sex-wise, breed-wise mortality is presented in Table 6. In all there were 25 deaths. The



most vulnerable age group was 0-3 months. The observations are also presented with minor details in the Table 7 to 9. Higher mortality was observed in calves

born in the month of April. The mortality was relatively higher in last two years as compared to the earlier performance of the same herd (Table 10).

Table 1: Growth Performance of dromedary breeds (2001-2008)

(Body weight in kg)

Classes	Birth	3 Months	6 Months	9 Months	1 Year	2 Years
Pooled	38.21±0.34 (261)	79.07±1.57 (220)	140.77±2.94(151)	186.79±3.97(121)	218.64±5.13(119)	290.83±6.44(83)
Breed	NS	NS	NS	NS	NS	*
Bikaneri	39.25±0.50 (106)	80.50±2.27(92)	134.44±3.76(68)	183.55±5.33(52)	219.06±6.33(55)	275.63±7.33(36)
Jaisalmeri	37.86±0.54 (94)	81.16±2.55(78)	143.79±4.60(49)	190.60±5.40(39)	217.18±6.52(38)	302.58±8.66(31)
Kachchhi	37.51±0.67 (61)	75.55±3.15(50)	144.07±5.53(34)	186.23±6.47(30)	219.68±8.21(26)	294.29±11.12(16)
Sex	NS	NS	NS	NS	NS	NS
Male	38.69±0.45 (141)	79.2 ±2.07(119)	141.17±3.79(83)	191.20±4.66(68)	221.49±6.05(62)	288.34±6.80(48)
Female	37.73±0.48 (120)	78.9±2.24(101)	140.36±3.92(68)	182.38±5.08(53)	215.78±6.06(57)	293.33±8.91(35)
Year	**	**	**	**	**	**
Year 2001	36.77±0.94 (30)	90.53±4.68(22)	128.77±10.77(8)	191.46±7.97(15)	215.98±8.11(19)	287.47±9.98(16)
Year 2002	35.96±0.91 (31)	79.38±4.09(28)	148.90±5.70(28)	203.41±7.45(17)	214.90±9.19(15)	309.48±10.61(14)
Year 2003	38.06±1.08 (23)	71.49±5.22(18)	135.74±7.073(19)	162.30±18.22(18)	199.08±8.59(18)	231.53±20.36(4)
Year 2004	37.15±0.93 (30)	68.30±4.09(28)	-	-	-	248.04±23.28(3)
Year 2005	37.24±0.97 (28)	74.60±4.45(24)	127.19±6.43(22)	172.73±18.22(3)	211.46±24.97(2)	310.64±9.72(17)
Year 2006	39.49±0.73 (49)	87.94±3.36(42)	158.50±4.73(41)	181.78±5.10(37)	222.40±5.72(38)	357.81±7.38(29)
Year 2007	40.28±0.76 (45)	78.87±3.57(37)	145.50±5.23(33)	209.08±5.54(31)	248.00±6.70(27)	-
Year 2008	40.72±1.02 (25)	81.49±4.7(21)	-	-	-	-

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

Table 2: Growth Performance of dromedary breeds (2001-2008)

(Body weight in kg)

Classes	3 Years	4 Years	5 Years	6 Years	7 Years	8 Years
Pooled	369.55±7.87(66)	423.62±6.75(76)	492.50±8.15(60)	567.90±7.70(35)	617.69±32.21(16)	616.78±14.88(9)
Breed	NS	NS	NS	*	NS	*
Bikaneri	364.63±11.46(28)	425.77±10.20(34)	491.19±13.50(23)	568.60±10.36(17)	644.64±32.62(7)	708.00±36.04(1)
Jaisalmeri	360.72±12.86(22)	416.54±11.69(24)	494.67±14.09(20)	595.16±13.91(10)	615.40±39.26(6)	592.00±16.12(5)
Kachchhi	383.29±14.37(16)	428.57±13.59(18)	491.63±15.01(17)	539.94±14.69(8)	593.02±46.67(3)	550.34±20.81(3)
Sex	NS	NS	NS	NS	NS	-
Male	372.28±10.52(32)	432.07±9.95(33)	496.26±12.96(23)	583.43±12.73(10)	634.16±62.00(1)	-
Female	366.81±10.99(34)	415.18±9.168(43)	488.74±10.33(37)	552.37±8.63(25)	601.22±18.92(15)	616.78±14.88(9)
Year	*	NS	NS	**	NS	-
Year 2001	363.21±18.45(11)	394.83±15.80(14)	474.15±16.83(15)	547.26±12.33(14)	603.79±36.82(11)	616.78±14.88(9)
Year 2002	346.36±26.88(4)	433.10±16.61(11)	496.21±18.20(11)	552.91±13.62(9)	631.58±37.88(5)	-
Year 2003	356.83±15.18(15)	416.76±13.77(18)	486.14±16.26(15)	603.53±12.89(12)	-	-
Year 2004	365.80±11.29(22)	417.22±1193(21)	513.48±13.75(19)	-	-	-
Year 2005	415.53±14.25(14)	456.22±15.99(12)	-	-	-	-

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



Table 3: Reproductive performance of the camel herd (2000-2008)

Year	Traits	Bikaneri	Jaisalmeri	Kachchhi	Pooled Breeds
2000	Mating	18	14	6	38
	Conception	13 (72.22 %)	12 (85.71%)	2 (33.33 %)	27 (71.05%)
	Calving	11 (84.61 %)	10 (83.33%)	2 (100%)	23 (85.19%)
2001	Mating	35	25	17	77
	Conception	24 (68.57%)	19 (76.00%)	9 (52.94%)	52 (67.53%)
	Calving	16 (66.66%)	12 (63.15%)	7 (77.77%)	35 (67.30%)
2002	Mating	24	12	10	46
	Conception	18 (75.00%)	6 (50.00%)	5 (50.00%)	29 (63.04%)
	Calving	16 (88.88%)	3 (50.00%)	4 (80.00%)	23 (79.31%)
2003	Mating	26	16	5	47
	Conception	18 (69.23%)	7 (43.75%)	4 (80.00%)	29 (61.70%)
	Calving	14 (77.77%)	5 (71.43%)	3 (75.00%)	22 (75.86%)
2004	Mating	22	11	9	42
	Conception	14 (63.63%)	6 (54.55%)	4 (44.44%)	24 (57.14%)
	Calving	13 (92.86%)	5 (90%)	4 (100%)	22 (92.86%)
2005	Mating	22	11	14	47
	Conception	18 (81.82%)	11 (100%)	11 (78.57%)	40 (85.11%)
	Calving	15 (83.33%)	11 (100%)	9 (81.82%)	35 (87.50%)
2006	Mating	16	12	6	34
	Conception	13 (81.25%)	11 (91.67%)	6 (100%)	30 (88.24%)
	Calving	12 (92.31%)	11 (100%)	4 (66.67%)	27 (90%)
2007	Mating	26	17	8	51
	Conception	19 (73.08%)	14 (82.35%)	6 (75%)	39 (76.47%)
	Calving	14 (73.68%)	14 (100%)	5 (83.33%)	33 (84.61%)
2008	Mating	30	16	18	64
	Conception	26 (86.66%)	11 (68.75%)	12 (66.66%)	49 (76.56%)

Table 4: Reproductive parameters of the camel herd

(in days)

Classes	Effect	Pooled	Bikaneri	Jaisalmeri	Kachchhi	Arab cross
Age at 1 st Conception	NS	1709±55 (78)	1746±41 (45)	1741±64 (18)	1760±75 (13)	1591±192 (2)
Age at 1 st Calving	NS	2062±60 (60)	2020±71 (25)	2120±71 (23)	2184±126 (8)	1924±178 (4)
1 st Calving Interval	NS	688±20 (43)	697±25 (17)	712±26 (15)	662±36 (8)	679±59 (3)
2 nd Calving Interval	*	779±23 (40)	712±19 (18)	695±23 (12)	733±27 (9)	976±00 (1)
3 rd Calving Interval	**	652±23 (35)	733±19 (18)	726±27 (9)	729±31 (7)	419±00 (1)
4 th Calving Interval	*	622±24 (23)	718±26 (14)	617±40 (6)	532±56 (3)	-
5 th Calving Interval	NS	648±37 (20)	657±41 (14)	638±62 (6)	-	-
6 th Calving Interval	NS	599±51 (15)	725±48 (8)	654±55 (6)	418±00 (1)	-
7 th Calving Interval	NS	703±35 (3)	693±41 (2)	713±00 (1)	-	-

* P < 0.05; ** P < 0.01 NS - Non significant



Table 5: Gestation length in dromedary breeds

Gestation	Bikaneri	Jaisalmeri	Kachchhi
1 st Gestation	392 (37)	386 (23)	381 (13)
2 nd Gestation	389 (29)	384 (17)	386 (12)
3 rd Gestation	386 (24)	383 (13)	389 (9)
4 th Gestation	386 (24)	380 (10)	384 (6)
5 th Gestation	387 (19)	378 (7)	386 (2)
6 th Gestation	390 (13)	385 (7)	-
7 th Gestation	388 (7)	380 (4)	-
8 th Gestation	382 (2)	-	-
9 th Gestation	388 (1)	-	-

Table 6 : Breed, sex and age wise mortality at NRCC (Year 2007-2008)

Breed	Sex		Age group			Pooled
	M	F	0-12 Months	1-3 Years	Above 3 Years	
Bikaneri	1	7	2	1	5	8
Jaisalmeri	7	3	6	1	3	10
Kachchhi	2	4	4	-	2	6
Arabcross	1	-	-	1	-	1
Total Mortality	11	14	12	3	10	25

Table 7: Mortality in dromedary in terms of age in days

S.No.	Age	Number of Animals Died
1	0-30 Days	7
2	31-60 Days	3
3	61-90 Days	2
4	1-3 Years	3
5	> 3 Years	10

Table 8: Month of birth and mortality (2007-08)

S.No.	Month of Birth	1 st Month	2 nd Month	3 rd Month	Total
1	December	2	-	-	2
2	January	1	1	-	2
3	February	1	-	1	2
4	March	-	-	-	-
5	April	2	2	1	5
6	May	1	-	-	1
7	Total	7	3	2	12

Table 9: Mortality- Month wise availability of the calves and percent death

Month of Birth	Born	Available	Died	Death (%)
April 2007	9	9	5	56
May 2007	1	5	1	20
December 2007	5	5	2	40
January 2008	15	18	2	11
February 2008	8	24	2	8
March 2008	4	26	0	0
April 2008	1	27	-	-



Table 10: Mortality at NRCC Farm (2002-08)

Year	Opening Strength	Closing Strength	Mortality
2002-03	272	247	15
2003-04	245	225	22
2004-05	225	239	13
2005-06	239	261	11
2006-07	261	270	20
2007-08	268	272	25

Table 11: Camel Herd Strength (2007-2008)

Breed Age	Opening 1-04-07		Calving		Purchased		Died		Auction		Raj. Govt.		Army		Closing 31.03.08	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Bikaner																
0-1 Yr	9	6	4	8			0	2	1	0					12	12
1-2 Yr	8	4					1	0							7	4
2-3 Yr	2	6													2	6
3-4 Yr	1	5													1	5
>4 Yr	12	51					1	4	2	4					9	43
Total	32	72					2	6	3	4					31	70
Jaisalmeri																
0-1 Yr	5	7	15	3			5	1	0	1					15	8
1-2 Yr	8	6					0	1	2	0					6	5
2-3 Yr	6	3							1	0					5	3
3-4 Yr	4	3													4	3
>4 Yr	23	36					1	2	5	5		2	0	15	29	
Total	46	55					6	4	8	6		2	0	45	48	
Kachchi																
0-1 Yr	5	4	5	4			2	2							8	6
1-2 Yr	6	2							1	0					5	2
2-3 Yr	2	1							0	1					2	0
3-4 Yr	6	3													6	3
>4 Yr	5	26					0	2	1	1					4	23
Total	24	36	5	4			2	4	2	2					25	34
Mewari																
0-1 Yr	0	0			0	1									0	1
1-2 Yr	0	0			0	0									0	0
2-3 Yr	0	0			0	0									0	0
3-4 Yr	0	0			0	2									0	2
>4 Yr	0	0			2	8									2	8
Total	0	0			2	11									2	11
A*B																
0-1 Yr	0	0	0	2											0	2
1-2 Yr	1	0					1	0							0	0
2-3 Yr	1	0													1	0
3-4 Yr	0	0													0	0
>4 Yr	0	3													0	3
Total	2	3	0	2			1	0							1	5
Grand Total	104	166	24	17	2	11	11	14	13	12			2	0	104	168



Project: Selection for the improvement of draughtability of camel breeds

Project Leader : Dr. S.C.Mehta,

Associate : Dr. U.K.Bissa

Selection of studs

Body measurements of all breedable males (32) of the Centre were recorded in October, 2007. Based on the literature that body length and related traits have significant effect on draughtability, 5, 5 and 4 males,

respectively of Bikaneri, Jaisalmeri and Kachchhi breed were selected mainly on the basis of body length (Table 12) and following independent culling level for the other two traits. K116 (Ghantel) could not successfully serve even a single female in the year 2006-07 and 2007-08 but in the year 2003-04, 2004-05, and 2005-06 it could successfully serve the females and the calves were born in the subsequent calving season. Detailed information is presented in Table 14. Sire K166 could successfully

Table 12: Breeding plan for the year 2007-2008

Breed	Available females (Approx)	Studs to be used for breeding	Sire	Dam	Females bred
Bikaneri	31+1 (A*B)	620 Go du	Purchased		6
		622 Modu	Purchased		6
		624 Rodu	Purchased		6
		474 Sohanki ka beta	285	151	-
		480 Kajalki ka beta	47	78	8
Jaisalmeri	20	228 Fatiya	Purchased		2
		218 Punia	Purchased		6
		232 Champia	Purchased		1
		216 Tariya	Purchased		1
		230 Bhagat	Purchased		1
Kachchhi	21	166 Satiya	Purchased		
		126 Dugli ka beta	72	107	11
		128 Madharki ka beta	72	101	1
		116 Ghantel	Purchased		

Table 13: Leastsquares means and analysis of variance of body parameters in adult camel (in cm)

Breed	Selection	N	Body Length	Heart Girth	Height At Withers
Over all	Selected	14	176.00	220.00	213.36
	Unselected	18	168.66	215.94	205.78
	Difference		7.34	4.06	7.58
	Significance	32	**	NS	*
Bikaneri	Selected	5	175.80	223.20	219.40
	Unselected	5	160.20	205.00	198.80
	Difference		15.6	18.2	20.6
	Significance	10	**	NS	**
Jaisalmeri	Selected	5	181.80	222.80	215.80
	Unselected	12	171.75	218.42	206.67
	Difference		10.05	4.38	9.13
	Significance	17	**	NS	*
Kachchhi	Selected	4	169.00	202.75	212.50
	Unselected #	1	174.00	230.00	241.00

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

Non-selection of K 114 (Patel) was due to the fact that the animal has been used extensively in the breeding from the year 2002 to 2007



serve two females in the year 2006-07 and the brand number of the calf born is 175, the other calf died with the mother due to dystokia. Non-selection of K 114 (Patel)

despite of having superior body measurements was due to the fact that the animal has been used extensively in the breeding from the year 2001 to 2007.

Table 14: Reproductive performance of the K 116 and K 166

Female No.	Date of Last Service	Date of Calving	Calf No.	Sex of the Calf
Sire – K 116				
Mating 2003-04		Calving 2004-05		
93	9/12.2.2004	27.2.2005	145	Female
Mating 2004-05		Calving 2005-06		
81	16/19.12.2004	Abortion	Abortion	
103	5 Services	Non Pregnant	Non Pregnant	
91	18/21.12.04	2.1.2006	150	Male
115	22/25.12.2004	19.1.2006	154	Male
119	11/14.01.05	04.02.2006	149	Female
Mating 2005-06		Calving 2006-07		
107	4/7.02.06	20.02.2007	172	Male
81	5/8.01.2006	Non Pregnant	Non Pregnant	
121	21/24.12.2005	21.1.2007	168	Male
123	20/23.12.2005	15.01.2007	163	Female
93	4 Services	Non Pregnant	Non Pregnant	
113	Research	12.4.2007	171	Female
119	Research	13.4.2007	178	Male
115	Research	07.04.2007	169	Female
Mating 2006-07		Calving 2007-08		
Six Females mated – Non conceived				
Sire – K 166				
Mating 2006-07		Calving 2007-08		
109	Four Services given	Non Pregnant		
105	2 Service	Allotted to other male		
133	5 Service	Non Pregnant		
93	5/6.01.2007	Non Pregnant		
129	7/8.01.2007	31.01.2008	Died due to dystokia	
83	17/18.02.2007	04.03.2008	175	Female

Project: Genetic improvement of milk production potential of Indian dromedary

Project Leader : Dr. S.C.Mehta

Associates : Dr. U.K.Bissa

Selection of females

Six females each of Bikaneri and Kachchhi breed were selected. Three Bikaneri females were in 1st lactation and 3 in 2nd lactation. Of the six Kachchhi



females three were in 4th lactation, one each was in 1st, 2nd and 3rd lactation. There was no choice to get the animals of same parity. K-129 died during parturition due to dystokia. K-111 was milked as per schedule only for two days, thereafter one teat was milked for subsequent 19 days and finally the animal got mastitis and has been discontinued (Table 15).

Milk Production

Two teats 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 was followed till the calf attains an age of three months. Highest milk production (6075 ml) was of K-117, which was in 3rd parity followed by 4393 ml in K-83, which was in 4th lactation (Table 16).

The leastsquares analysis of variance indicated that the Kachchhi females were superior to Bikaneri in noon, evening and total milk production. This superiority of Kachchhi breed is subjected to the differences due to parity of the animals in the two breeds. The production in morning was higher as compared to noon and evening and the production from rear teat was greater than front teat during all the times of milking (Table 17).

Table 15: Status of female camels under milking

Animal No.	Parity	Remarks
Bikaneri		
515	2	Two teat milking
523	2	Two teat milking
537	2	Two teat milking
541	1	Two teat milking
543	1	Two teat milking
545	1	Two teat milking
Kachchhi		
83	4	Two teat milking
103	2	Two teat milking
105	4	Two teat milking
111	4	First 2 days – Two teat milking Subsequent 19 days – One teat milking Milking stopped thereafter due to Mastitis
117	3	Three teats – Two teat milking
129	1	Died

Table 16: Average daily production of milk

(Two teat milking, milk yield in ml)

Animal No.	Morning		Noon		Evening		Total
	Front	Rear	Front	Rear	Front	Rear	
K-83	837	950	621	758	565	672	4393
K-105	479	595	411	503	415	541	2943
K-117	1335	1564	790	846	707	833	6075
B-515	729	922	437	556	425	541	3610
B-523	444	623	345	460	365	481	2718
B-537	398	490	340	439	331	433	2429
B-541	295	415	285	418	263	362	2038
B-543	619	745	412	471	411	443	3101
B-545	490	671	351	462	344	454	2772



Table 17: Leastsquares mean of average daily milk production and analysis of variance (Two teat milking, milk yield in ml)

Milking	Bikaneri (6)	Kachchhi (3)	Pooled (9)
Morning_FT	495.83±108.21	883.67± 153.03	689.75±93.71
Morning_RT	644.33±123.97	1036.33±175.32	840.33±107.36
Noon_FT	361.67±45.53*	607.33±64.38*	484.50±39.43
Noon_RT	467.67±42.16*	702.33±59.63*	585.00±36.51
Evening_FT	356.50±37.77*	562.33±53.42*	459.42±32.71
Evening_RT	452.33±37.82**	682.00±53.49**	567.17±32.76
Total	2778.00±389.85*	4470.33±551.33*	3624.17±337.62

*P<0.05, **P<0.01 FT-Front teat, RT-Rear teat

Table 18: Body weight of calves of females under milking

(in kg)

Breed	Birth Weight	1 Month Wt	2 Months Wt	3 Months Wt
Bikaneri	39.17 (6)	65.17 (6)	85.20 (5)	104.40 (5)
Kachchhi	40.00 (5)	57.40 (5)	74.00 (3)	109.00 (2)
Pooled	39.55 (11)	61.64 (11)	81.00 (8)	105.70 (7)

Body weight of calves

The body weight of calves of the females under milking were monitored to see if there is any adverse effect due to two teat milking on their growth performance. The average birth weight was 39.55 kg and the 1st, 2nd and 3rd months weight were respectively 61.64, 81 and 105.7 kg, which were in normal range.

Project: Molecular genetic studies in Indian camel : Microsatellite markers for genetic

characterisation of Bikaneri, Jaisalmeri and Kachchhi camel

Project Leader: Dr. S.C. Mehta

Blood samples of 37 Bikaneri, 8 Kachchhi, 8 Jaisalmeri and 12 Mewari camels were collected and included in the experiment. 10 Primers of LCA series were procured and the PCR conditions were standardized. In LCA 30 a strong dimmer and in LCA 22 size variation was observed. LCA 33 was observed to be polymorphic with three alleles where as the LCA 68 was monomorphic.

Table 19: Amplification of LCA series of microsatellite

Primer	Annealing Temp.	Reported Size (bp)	Observed Size
LCA 08	58°C	228-262	250
LCA 18	54°C	221-241	240
LCA 19	58°C	84-118	90
LCA 22	60°C	114-120	170
LCA 24	58°C	108-132	130
LCA 30	60°C	223-239	230
LCA 33	60°C	122-130	122
LCA 36	61°C	203-209	203
LCA 65	58°C	165-191	180
LCA 68	61°C	191-209	200



Unit: Camel Physiology

Project: Haematological, biochemical, enzymatic and hormonal profiles of camel

Sub-Project : Development of Kidney function test

Project Leader: Dr. Aminu Deen

Serum Creatinine (SC) and Serum Urea Nitrogen (SUN) were monitored for all the animals of the institute herd. Effect of breed, sex and age was evaluated. Endogenous creatinine clearance study to measure glomerular filtration rate was conducted on 18 male camels, six from each of three breeds of camels viz. Bikaneri, Jaisalmeri and Kachchi. Urine bags were applied and urine was collected continually for 6 days. Urine output at 24 hr intervals, urine creatinine from a pooled sample of urine for 24 hrs and serum creatinine once daily were measured. Endogenous creatinine clearance was derived using formulation UV/P where U indicates urine creatinine (mg/L), V indicates urine output (ml/Minute) and P indicates serum creatinine (mg/L).

Table 20 shows the mean values of serum creatinine, serum urea nitrogen and urea nitrogen/serum creatinine ratio of three breeds of camels. The values of SC and SUN/SC ratio differ significantly ($P < 0.05$) between breeds, while those of serum urea nitrogen did not differ ($P > 0.05$).

Table 20: Serum creatinine, urea nitrogen and urea nitrogen/creatinine ratio in three breeds of camels

Breed	Serum creatinine (mg/dl)	Serum urea nitrogen (mg/dl)	Serum urea nitrogen/ Creatinine ratio
Bikaneri	1.88 ± 0.05 ^a	21.51 ± 1.10	12.30±0.83 ^d
Jaisalmeri	2.19 ± 0.07 ^b	22.47 ± 1.45	10.38±0.49 ^e
Kachchhi	2.03 ± 0.08 ^c	19.45 ± 1.00	10.13±0.60 ^f

The sex wise mean values of SC, SUN and SUN/SC ratio is shown in Table 21. SC was significantly higher in male ($P < 0.05$), while SUN and SUN/SC ratio was significantly higher in females.

Table 21: Sex wise serum creatinine, urea nitrogen and urea nitrogen/creatinine ratio in camels

Sex	Serum creatinine (mg/dl)	Serum urea nitrogen (mg/dl)	Serum urea nitrogen / creatinine ratio
Male	2.26±0.08 ^a	18.97±1.61 ^c	8.43±0.53 ^e
Female	1.94±0.04 ^b	22.29±0.76 ^d	12.08±0.48 ^f

The age wise mean values of SC, SUN and SUN/SC ratio is shown in Table 22. The values of SC and SUN/SC ratio did not differ significantly ($P > 0.05$) in different age groups, while SUN differ significantly ($P < 0.05$) between different age groups.

Table 22: Age wise serum creatinine, urea nitrogen and urea nitrogen/ creatinine ratio in camels

Age Group	Serum creatinine (mg/dl)	Serum urea nitrogen (mg/dl)	Serum urea nitrogen/ Creatinine ratio
< 1 year	2.05±0.08	16.70±1.57	9.38±1.39
1-2 year	1.87±0.09	15.36±1.40	8.32±0.79
2-5 year	2.16±0.13	25.62±2.01	12.26±1.02
5-10 years	2.00±0.07	23.41±1.80	11.86±0.06
> 10 year	2.03±0.04	21.05±0.80	11.03±0.47

The normal values for three breeds, both sex and different age groups in dromedary camels were established by this study.

Urine Output

Urine output (UO) in 24 hours in 18 male camels of three breeds monitored for a total of 108 times (six replicates each camel) has been presented in Table- 23. Values of urine output in camels of the centre were recorded but it is a highly variable parameter in camel. Camel has an extra ordinary ability to concentrate urine when water availability is scarce.

Urine creatinine concentration:

Urine creatinine (UC) in 24 hours in 18 camels of three breeds monitored for a total of 108 times (6 times each camel) has been presented in Table- 23.

Total creatinine excreted in 24 hours

Total Creatinine (TC) excreted in 24 hours in 18 camels of three breeds monitored for a total of 108 times (6 times each camel) has been presented in Table- 23.

Glomerular filtration rate

Glomerular Filtration Rate (GFR) in 18 camels of three breeds monitored for a total of 108 times (6 times each camel) has been presented in Table-23. Correlations between GFR and daily urine output has been presented in Table 24, which showed a significant ($P < 0.01$) correlation between GFR and UO.



Table 23 : Urine output, urine creatinine, total daily creatinine excreted, glomerular filtration rate, and creatinine clearance in three breeds of male camels

		Bikaneri	Jaisalmeri	Kachchhi
Daily urine output (L)	Minimum individual average	2.59±0.10	2.38±0.18	2.13±0.23
	Maximum individual average	4.61±0.40	4.37±0.22	4.16±0.24
	Overall average	3.76*±0.20	3.16±0.16	3.11±0.19
Urine Creatinine mg/L	Minimum individual average	1380.0± 151.0	1278.3± 198.6	1669.8± 240.8
	Maximum individual average	2224.6± 29.1	2198.1± 99.0	2410± 261.8
	Overall average	1773.2± 75.7	1757.8± 72.0	1912.8± 81.2
Daily Creatinine excreted (G)	Minimum individual average	4.98± 0.22	3.82± 0.19	4.38± 0.72
	Maximum individual average	9.19± 1.15	9.59± 0.58	7.09± 0.50
	Overall average	6.39± 0.35	5.53± 0.38	5.63± 0.69
Glomerular Filtration rate as determined by Creatinine clearance (ml/min)	Minimum individual average	167.2± 7.0	133.3± 10.0	204.2± 27.0
	Maximum individual average	325.8± 46.2	323.6± 29.7	390.3± 25.7
	Overall average	229.8± 13.5*	184.5± 14.7	190.6± 10.6*
Creatinine clearance per kg body weight (ml/min)	Minimum individual average	0.282± 0.011	0.222± 0.015	0.273± 0.036
	Maximum individual average	0.549± 0.057	0.602± 0.051	0.646± 0.063
	Overall average	0.451± 0.024	0.257± 0.083	0.450± 0.026

Table 24 : Correlations between urine output and Glomerular Filtration rate

	Glomerular Filtration Rate	Urine Output
Glomerular Filtration rate	1.000	0.643**
Significance (2-tailed)	-	.000
N	108	108
Urine Output	0.643**	1.000
Significance (2-tailed)	.000	-
N	108	108

** Correlation is significant at the 0.01 probability level (2-tailed).

Sub-Project : Strengthening of RIA facilities

Project Leader: Dr. Aminu Deen

Assay for LH

An IRMA technique based diagnostic kit was tried for quantitation of cameline LH but results indicated that it did not work well. The apparent reason might be the monoclonal antibodies employed in kit specific for some epitope of mouse LH might be unable to find that epitope in camel.

Validation of tail cocking method of pregnancy diagnosis with serum progesterone assay

Traditional Tail curling test and serum progesterone concentration measurements were performed on day 14-15 after mating on female camels for diagnosis of pregnancy. The results of two tests were compared. Results revealed that of the 89 observations for females that did not curl tail (non-pregnant), 86 (96.6

%) were in confirmation with P_4 (<1 ng/ml) on day 15. Of the 66 observations for curling of tail (pregnant), only 45 (68.1%) were in confirmation with (>1 ng/ml). So it is concluded that tail-curling test is effective in early detection of non-pregnant females for breeding management of the herd. However, repeated tail tests on weekly basis are required to detect false positive and those emptied due to early embryonic deaths.

Relation of testosterone profile with early and late induction of rutting in male camels

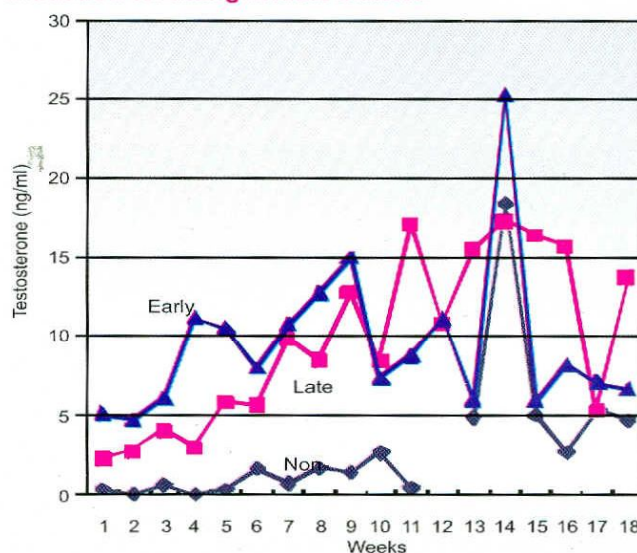


Fig.1: Testosterone profiles of early rutting, late rutting and non-rutting groups of camels



Weekly serum testosterone concentration was measured in males allocated for breeding management of the institute herd. The results revealed that early rutting male camels showed an early rise in serum testosterone concentration than late rutting and testosterone concentration was significantly high in rutting males ($P < 0.01$) compared to non-rutting.

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, College of Technology and Engineering, Udaipur)

Project Leader: Dr. A.K.Roy,
Associates: Dr. A.K. Nagpal, Dr. C. Bhakat and Dr. G.S. Tiwari

The electric generation and agro-processing unit have been installed and the animals are being trained to run this machine efficiently. The animals have

been trained for carrying out draught ability studies under the project. The daily feed consumption of these animals is also being monitored in the last quarter of this year. A polygraph machine has been procured to record the physiological changes while working.

Project: Development and Assessment of Camel milk products

Project Leader: Dr. Gorakh Mal
Associate: Dr. C. Bhakat

Experiments were carried out for the preparation of camel milk paneer and the protocol for making camel milk paneer was standardized. Paneer can be prepared from the camel milk by using Citric acid and CaCl_2 for the coagulation (Fig. 2 A-F). 0.5-1.0% Citric acid along with 0.1-0.2% CaCl_2 yields a good quality paneer with a recovery of 9-10% (Table 25). The moisture and fat content were 51.245.21% and $18.5 \pm 23.40\%$ respectively. Camel milk chocolate and sugar-free kulfees were introduced for sale through centre camel milk parlour (Figures 2 G-H).

Table 25: Use of Citric acid and CaCl_2 for preparation of paneer from camel milk

Source	Coagulant	Texture of the final product	Observations	Conditions for preparation
Camel milk (pure)	Citric acid 0.5% 1.0% 1.5% 2.0%	Loosely bound	Recovery: 6.4-6.8% Turning yellow after 15 days at 4°C	Heated to 82°C-85°C /5min; cooled to 70°C; added coagulant
Camel milk+ cow milk 4:1 3:1 2:1 1:1	Citric acid 0.5%, 1.0%, 1.5%, 2.0% -same- -same- -same-	Loosely bound	Recovery: 6.5-8.0% Turning yellow after 15 days at 4°C	Heated to 82°C-85°C /5min; cooled to 70°C; added coagulant
Camel milk (pure)	Citric acid+ CaCl_2 0.5%+0.01% 0.5%+0.02% 0.5%+0.04% 0.5%+0.08% 0.5%+0.10% 0.5%+0.20%	Loosely bound Good binding -same-	Recovery: 7.5-8.5% No colour change up to 21 days Recovery (9.3%) Recovery (10.0%) No colour change up to 28 days	Heated to 82°C-85°C /5min; cooled to 70°C; added coagulants
Camel milk (pure)	Citric acid+ CaCl_2 1.0%+0.01% 1.0%+0.02% 1.0%+0.04% 1.0%+0.08% 1.0%+0.10% 1.0%+0.20%	Loosely bound Good binding -same-	Recovery: 7.5-8.5% No colour change up to 21 days Recovery (9.0%) Recovery (9.5%) No colour change up to 28 days	Heated to 82°C-85°C /5min; cooled to 70°C; added coagulants



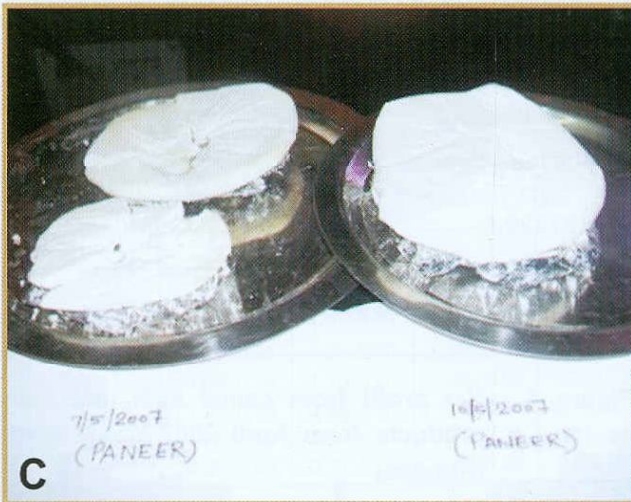
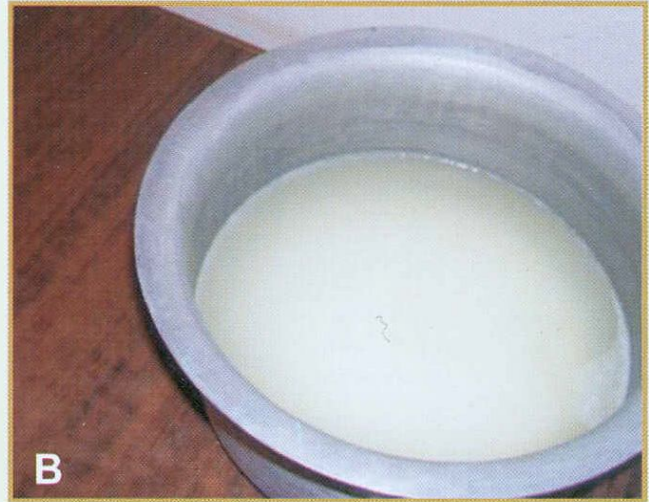




Figure 2: (A) Precipitation of camel milk after addition of 0.5% Citric acid (B) Precipitation of camel milk after addition of 0.5% Citric acid+ 0.2% CaCl_2 (C) Pure camel milk paneer (1% Citric acid); (D) Camel and cow milk (1:1) paneer (1% Citric acid); (E) Pure camel milk (0.5% Citric acid+ 0.2% CaCl_2) paneer (F) Paneer from pure camel milk (1.0% Citric acid+0.20% CaCl_2); (G) Camel milk Chocolate Kulfi; (H) Camel milk sugar-free kulfi

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

Camel milk and milk products viz., Kulfi (Kesar, Chocolate and Sugar-free) 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 milk products was highest in March and February months (Fig. 3). Profit of Rs. 59712 was observed during the year (Fig. 4).

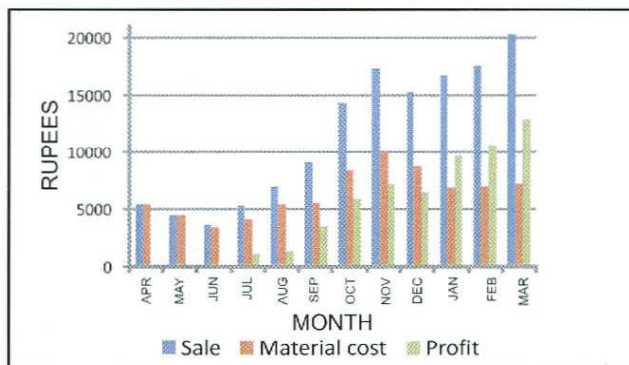


Figure 3: Month-wise sale, material cost and profit from camel milk parlour

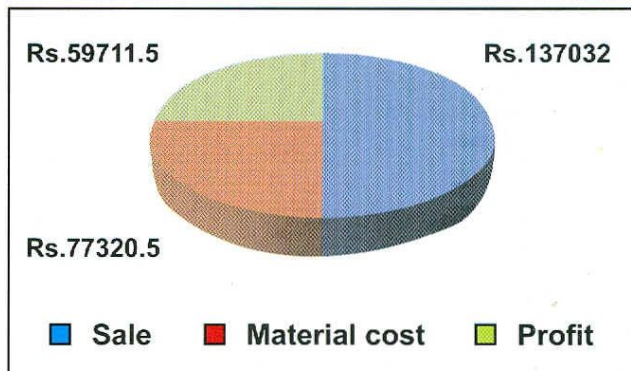


Figure 4 : Net profit from camel milk and milk products from April 2007-March 2008 (Rupees)

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

Project Leader : Dr. KML Pathak and Dr. RA Bumb

Associates : Dr. Gorakh Mal, Dr. R. D. Mehta, Dr. B. C. Ghyia and Dr. Ranu Jakar

Camel milk cream prepared by NRCC, Bikaner can be used as a moisturizing cream. This was concluded on the basis of an open pilot study conducted in 25 test group patients and 25 control group patients for 3 months. Moisturizing effect with glowing/ shining of skin was observed after using the camel milk skin cream. Similar findings were also observed in control group. Experiment is going on to evaluate the skin cream for anti wrinkling property.



Project: Evaluation of camel milk proteins and their application

Sub-project: Effect of heat treatment on camel milk whey proteins

Project Leader : Dr. Gorakh Mal

Associate : Dr. (Mrs) D. Suchitra Sena

Camel milk samples were collected from nine lactating camels belonging to three different breeds and three cow milk samples procured locally. Milk samples were heated at different temperatures (63°C, 70°C, 80°C, 90°C and boiled) for 30 minutes. Whey was separated from the heated/ boiled and raw camel and cow milk samples. Average whey proteins concentration in raw camel milk were 0.90±0.04, 1.31±0.01 and 0.95±0.03 per cent respectively in Bikaneri, Jaisalmeri and Kachchhi camels. In cow milk it was found to be 0.44±0.03 per cent only. Denaturation of camel and cow milk whey proteins was varied at different temperatures (Table 26). In Jaisalmeri, Bikaneri, Kachchhi and cow

Table 26: Whey proteins (%) levels of camel and cow milk at different temperatures (°C)

Temperature	Camel Breeds			Cow
	Bikaneri	Jaisalmeri	Kachchhi	
Raw	0.90±0.04	1.31±0.01	0.95±0.03	0.44±0.03
63°C	0.73±0.06	1.24±0.01	0.73±0.05	0.36±0.02
70°C	0.65±0.06	1.10±0.01	0.60±0.03	0.27±0.02
80°C	0.57±0.05	0.96±0.01	0.48±0.04	0.17±0.02
90°C	0.52±0.03	0.84±0.03	0.43±0.01	0.10±0.01
Boiled	0.28±0.01	0.81±0.02	0.35±0.02	0.07±0.01

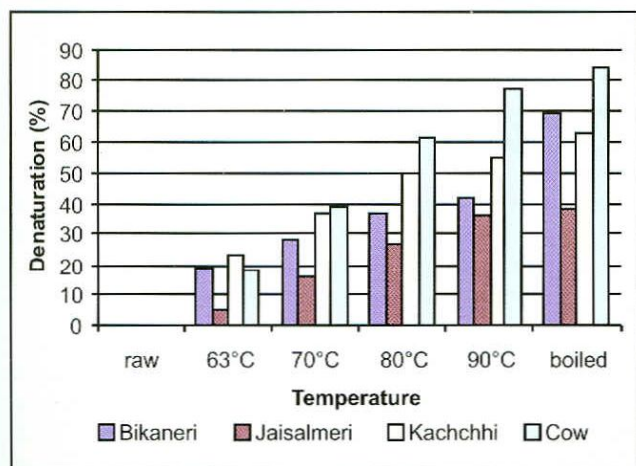


Figure 5: Whey proteins denaturation (%) at different temperatures

milk samples, whey proteins denaturation at 63°C was 5.34, 18.89, 23.15 and 18.18% respectively (Figure 5). At 90°C, highest whey proteins loss was observed in Kachchhi followed by Bikaneri and Jaisalmeri camels.

Unit: Camel Reproduction

Project: Reproductive management of the herd animals, study infertility, their possible causes and remedial measures

Project Leader : Dr. Aminu Deen

Fertility, infertility, first service conception rate and overall conception rate of three breeds of female camel

A total of 65 female camels of three breeds Viz. Bikaneri (n=30), Jaisalmeri (n=17) and Kachchi (n=18) were bred with the allocated males of the same breed. Results on fertility, infertility, first service and overall conception rate(s) of three breeds of camels have been presented in Table 27. First service conception rate and overall conception rate were higher in Bikaneri breed than Jaisalmeri and Kachchi. Similarly, infertility rate was low in Bikaneri than Jaisalmeri and Kachchi.

Effect of single versus repeated services

The results shown in Table 28 revealed that when matings are given after ascertaining follicular presence, repeated services had no beneficial effects over single service on pregnancy rate.

Fertility of male camels

A total of 14 studs, four each from Bikaneri, Jaisalmeri and Kachchhi breeds and two from Mewari breeds were tried for breeding female camels. Pregnancy rates were calculated on the basis of number of females conceived/number of services. Pregnancy rate of Bikaneri studs varied from 40-58%, while pregnancy rate of Jaisalmeri and Kachchi were low.

Copulation time of fertile camels

Copulation time was recorded in six male camels. It did not differ significantly for single service. Significant difference was observed ($P < 0.05$) between camels B-624 & B-622, B-624 & B-620 and B-622 & K-126 for two services and between B-624 & K-126 for three services. However copulation time did not differ for pregnant and non-pregnant groups indicating that pregnancy rate is not affected by copulation time (Table 29).



Table 27: Fertility, infertility, first service conception rate and overall conception rate of three breeds of camel

Breed	N	P	NP/I	Cumulative no. and % of animals conceived after different number of services				
				1 Service	2 Services	3 Services	4 Services	5 Services
Bikaneri	30	27 (90%)	3 (10%)	16 (53.3%)	21 (70%)	23 (76.6%)	24 (80%)	27 (90%)
Jaisalmeri	17	12 (70.6%)	5 (29.4%)	4 (23.5%)	8 (47.0%)	9 (52.9%)	11 (64.7%)	12 (70.5%)
Kachchi	18	12 (66.7%)	6 (33.3%)	1 (5.5%)	4 (27.7%)	8 (44.4%)	10 (55.5%)	12 (66.6%)
Total	65	51 (78.5%)	14 (21.5%)	21 (32.3%)	33 (50.7%)	40 (61.5%)	45 (69.2%)	51 (78.4%)

Table 28: Effect of single versus repeated services after ascertaining the follicular presence, on pregnancy rates in female camels

Breed	No. of Services					
	Single Service		Two Services at 72 h interval		Three Services regularly for three days	
	No. of Services	No. of conception (Pregnancy rate %)	No. of Services	No. of conception (Pregnancy rate %)	No. of Services	No. of conception (Pregnancy rate %)
Bikaneri	35	17(48.5)	19	8 (42.1)	7	2 (28.5)
Jaisalmeri	25	5 (20)	16	3 (18.7)	9	3 (33.3)
Kachchi	10	5 (50)	8	2 (25)	11	5 (45.4)
Overall	70	27 (38.5)	43	13 (30.2)	27	10 (37)

Table 29: Copulation time in relation to fertility of female camels

Single Service	Pregnant	5.215±0.891 (n=19) ^{NS}
Single Service	Non-pregnant	4.086±0.310 (n=23) ^{NS}
Double Services	Pregnant	4.044±0.600 (n=9) ^{NS}
Double Services	Non-pregnant	6.107±0.906 (n=21) ^{NS}
Three Services	Pregnant	8.325±1.304 (n=9) ^{NS}
Three Services	Non-pregnant	5.864±0.487 (n=10) ^{NS}

Artificial Insemination in camel with the introduction of vasectomized teaser

Seven females that failed to conceive by natural services were used for the AI. They were mated with the vasectomised teaser, followed by insemination with freshly collected semen. No exogenous hormonal supplementation to induce ovulation was given. None of the seven females could be impregnated. Therefore clouds of uncertainty for poor and inconsistent results with artificial insemination in dromedary could not be resolved even with vasectomised teaser.

Project: Isolation and characterisation of the major gel proteins in camel semen

Project Leader : Dr. Gorakh Mal

Associate : Dr. (Mrs.) D. Suchitra Sena

A total of 82 seminal plasma samples from eight Jaisalmeri camels were analyzed for various parameters viz., Total protein, Ca, P, Mg, Na, K, Cu, Zn, Fe and Mn (Table 30).

Further studies were carried out on the process of liquefaction of camel semen. Higher molecular weight proteins were found to present in fresh seminal plasma and aliquots taken at different time intervals. Higher molecular weight seminal plasma proteins could remain stable up to 41 h with individual variations and after that these proteins start to degrade as the camel semen starts to liquefy (Figures 6-9). This might be due to proteolytic cleavage of the coagulating proteins.

Efforts were made to isolate the seminal plasma proteins by affinity chromatography. The bound proteins were eluted with different concentrations of Urea and NaCl (Fig. 10). Protein fractions were lyophilized and were analyzed by SDS-PAGE. Bound proteins could not be successfully eluted (Figure 11).



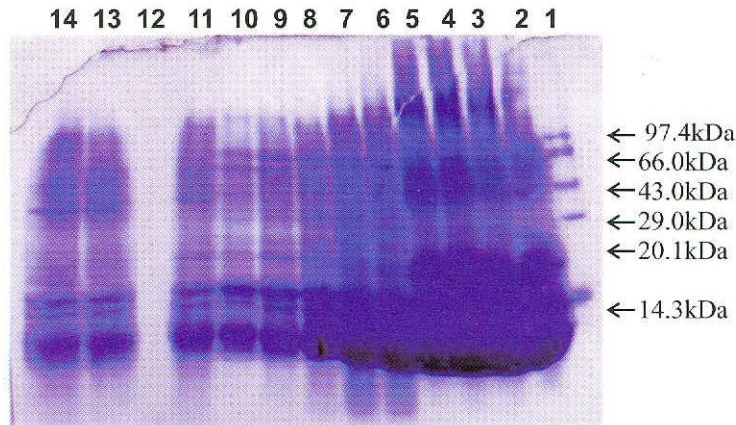


Figure 6: Seminal plasma samples of J-224 run on 15% gel. Lanes-1, Marker (RPMW-M); 2, 0h; 3, 17h; 4, 22h; 5, 25h; 6, 41h; 7, 48h; 8, 65h; 9, 89h; 10, 96h; 11, 113h; 13, 120h and 14, 137h.; 12, -ve control.

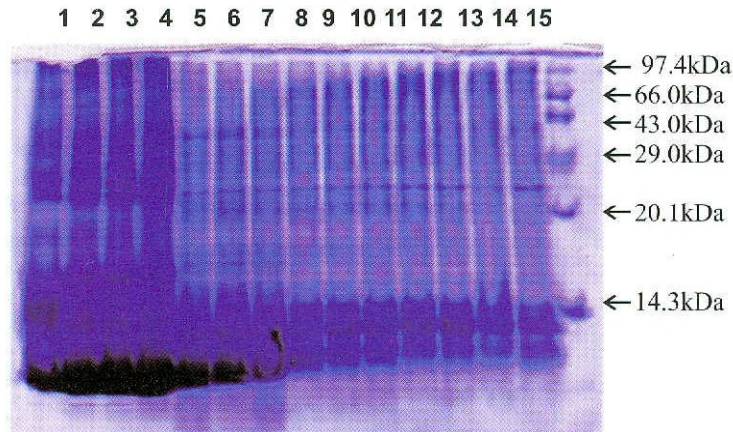


Figure 7: Seminal plasma samples of J-128 run on 15% gel. Lane-1, 0h; 2, 16h; 3, 20h; 4, 23h; 5, 40h; 6, 44h; 7, 47h; 8, 64h; 9, 68h; 10, 72h; 11, 89h; 12, 93h; 13, 96h; 14, 113h and 15, marker (RPMW-M).

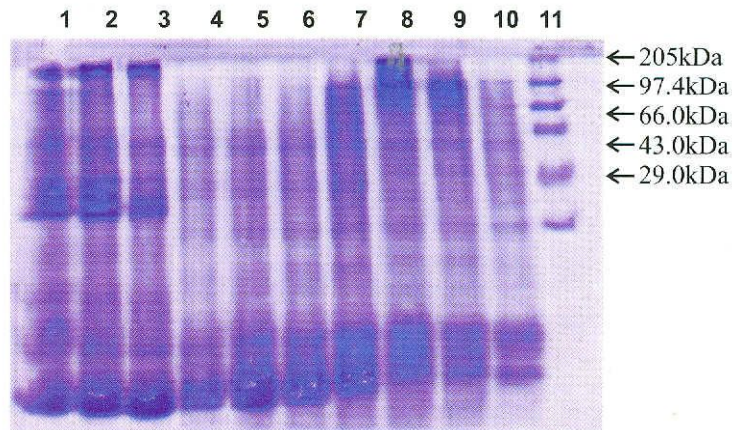


Figure 8: Seminal plasma samples of J-120 run on 15% gel. Lane-1, 0h; 2, 17h; 3, 21h; 4, 24h; 5, 41h; 6, 44h; 7, 47h; 8, 64h; 9, 68h; 10, 71h and 11, marker (RPMW-H).



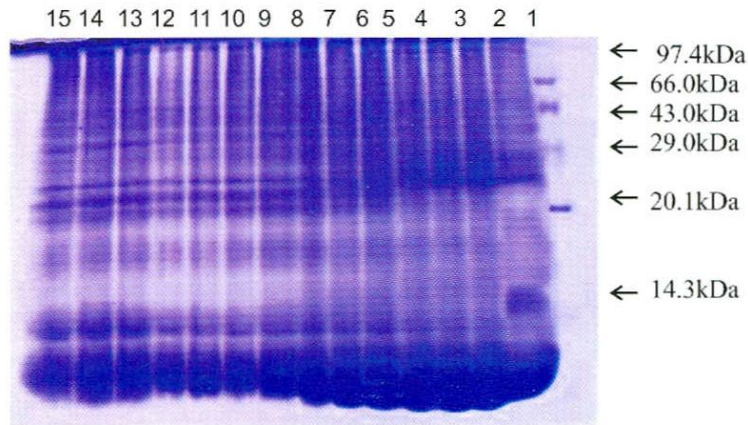


Figure 9: Seminal plasma samples of J-214 run on 15% gel. Lane-1, marker RPMW-M; 2, 0h; 3, 17h; 4, 24h; 5, 41h; 6, 44h; 7, 47h; 8, 65h; 9, 72h; 10, 89h; 11, 93h; 12, 96h; 13, 113h; 14, 120h and 15, 137h.

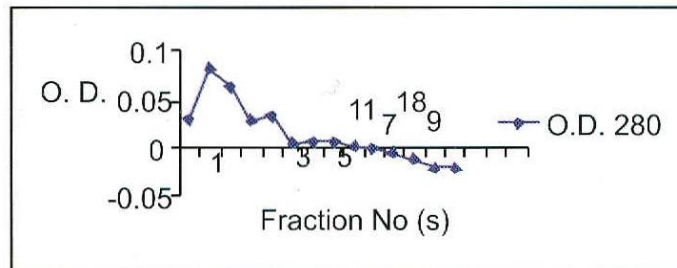


Figure 10: Fractions were collected after eluting with different buffers (fractions 1-11 with PB, 15 with PBS, 18 with 0.5M urea in PBS and 21 with 5M urea in PBS)

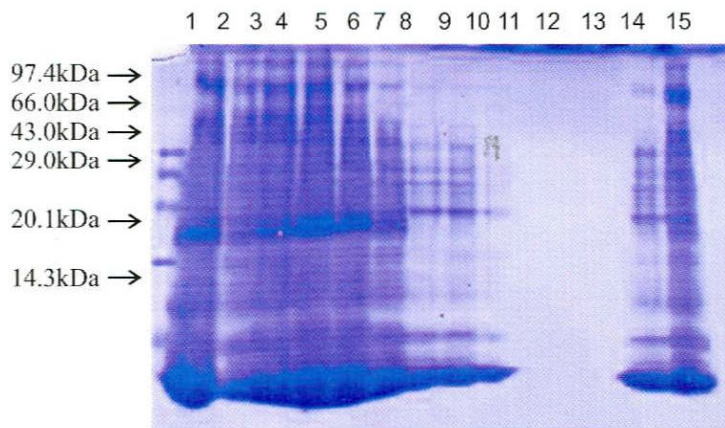


Figure 11: Purified seminal plasma samples collected by Affinity Chromatography run on 15% gel. Lane 1 having marker RPMW-M. Lane 2 having fresh plasma sample of J-214. Lane 3-10 having fractions 1-8 eluted with PB; lane 11 and 12 having fractions eluted with 1M NaCl in PB, lane 13 ve control and lanes 14 and 15 having fractions 51 and 52 eluted with PB (affinity chromatography of samples J-224; repeated experiment).



Table 30: Concentration of various parameters in the seminal plasma samples

Parameter	Mean \pm S.E.	Range
Total protein (g/dL)	2.74 \pm 0.11	0.79 - 4.55
Ca (mmol/L)	4.42 \pm 0.06	2.23 - 4.86
P (mmol/L)	1.56 \pm 0.05	0.80 - 2.83
Mg (mmol/L)	2.43 \pm 0.09	1.33 - 4.69
Na (mmol/L)	154.06 \pm 0.92	124.00 - 163.00
K (mmol/L)	16.85 \pm 0.72	11.0 - 34.9
Cu (ppm)	1.58 \pm 0.16	0.12 - 6.66
Zn (ppm)	9.15 \pm 0.85	2.50 - 52.60
Fe (ppm)	55.87 \pm 4.39	10.12 - 163.62
Mn (ppm)	1.79 \pm 0.17	0 - 5.25

Project : Studies on reduction of inter-calving period in camel**Project Leader:** Dr. Sumant Vyas

Eighteen female camels parturited during the breeding season (up to 10th February, 2008) were taken for the study. A male camel was paraded before them for 30 minutes on alternate day. The females were not subjected to genital examination prior to mating. Therefore all females were mated at 30 days of parturition with virile studs. Only few camels (when found non-pregnant) could be given subsequent mating at 50 and 70 days of parturition before 30th March. six females are tentatively diagnosed as pregnant (30% conception). This will result in reduction of around 300 days of inter-calving period in each of these six females as compared to female camels subjected to traditional system of mating.

Table 31. Service given to post-parturient camels

S. N.	Camel No.	D.O.P	Date of service			Pregnant (Sire no.)
			I	II	III	
1	J 344	1/1/08	1/2/08	27/2	19/3	Yes (J 218)
2	B 505	3/1/08	5/2/08	-	-	Yes (B 622)
3	J 117	11/1/08	13/2/08	-	-	Yes (J 218)
4	J 65	15/1/08	20/2/08	10/3/08	-	Yes (J 218)
5	J 85	3/2/08	7/3/08	-	-	Yes (J 218)
6	B 443	9/2/08	6/3/08	-	-	Yes (B 622)

Table 32 : Year-wise results of Post-parturient breeding

S.N.	Year	Post parturient females		Pregnant
		Examined	Bred	
1.	2004-05	18	9	5
2.	2005-06	30	18	10
3.	2007-08	-	18	6

Unit: Camel Health**Project: Epidemiology of infectious diseases of camel****Project Leader: Prof. K.M.L. Pathak****Sub project: Epidemiology of Bacterial and Fungal Diseases of camels****Sub Project Leader:** Dr. FC Tuteja

Four one-day camps were organized to facilitate collection of samples and required information. In these camps announcement were made for getting their sick animals treated. The respondents were attended and relevant information and required samples were collected. Camps were organized at

1. Dharam Kanta Gajner Road, Bikaner, 12 cases were attended.
2. Gogamedi Animal Fare, Nohar, Hanumangarh, 32 cases were attended
3. Laadnu Animal Fare, Nagaur, 22 cases were attended.
4. Sindhri Animal Fare, Barmer, 50 cases were attended.

In addition Balotra, Barmer was also visited to know the disease status in different herds, 30 cases were attended. A total of 146 respondents are briefly summarized:

Sub-Project: Epidemiology of major parasitic diseases of camel**Sub-project leader :** Dr. S.K. Ghorui**Associate :** Dr. G. Nagarajan

During the period (Aug '07 to Mar '08) under report, state animal fair of Gogamedi (Hanumangarh), Ladnu (Nagaur) and Sindhri (Barmer) were visited. In these animal fairs large number of camels are brought from different parts of Rajasthan and also from different parts of adjoining States for trading. Beside the fairs, the project team also visited different parts of Bikaner district



Table 33: System wise diseases of camel observed in treatment camps

System Involved	Skin	Gastro Intestinal Tract	Musculo Skeletal	Respiratory	Reproductive	Urinary	Haemic	Miscellaneous
Symptoms/ Lesions	Sores, eruptions, cut, wound, injury, saddle gall, nasal injury, Hyperkeratosis, thikria etc.	Diarrhoea, dysentery, constipation, gingivitis, anorexia etc	Lameness, arthritis, shivering, joint swelling etc.	Pneumonia	Vaginal discharge, testicle atrophy, history of abortion etc	Retention of urine	Anemia weakness	Allergy, Shivering, General weakness etc
No of cases	64	45	17	2	12	1	1	13
No of cases with more than one system involvement were 7 (GIT+ Skin), 1 (Skin+ Rep.+GIT) and 2 (Rep+GIT)								
Samples collected	Pus, skin scrapping	Fecal samples	Synovial fluid	Nasal swabs	Vaginal discharge, blood	-	-	-
No of samples	61	15	1	1	10	-	-	-
All the above samples were examined for bacterial and fungal isolations using Nutrient and Sabouraud's dextrose agar. No of isolates were								
Bacterial	45	12	-	-	1	-	-	-
Fungal	44	10	1	1	1	-	-	-

Bacterial isolates identified were *Staph. aureus* (12), *Staph. epidermidis* (18), *Corynebacterium* spp (12) *Bacillus* spp (11), *Pseudomonas* spp. (1), Yeast (1)..

and one of the remote villages of Barmer i.e Bhoonkawhere individual owner traditionally maintained camel herd of 250 to 500 camels only for their earning through camel trading.

Both wet smear and Giemsa stained thin blood smear were adopted for detection of parasites in the field and laboratory condition. Considering the fact of low parasitaemia in the peripheral blood, the level of parasitological detection found least.

During the period, all the 155 serum samples have been analysed in duplicate for the presence of antibody against trypanosomes by indirect ELISA and these values are expressed in terms of mean ELISA value.

Table 34: Examination of Blood samples for trypanosomosis in camel

Place	No of Samples	Parasitological	Ab-ELISA(%)	PCR (%)
Gogamedi	30	5 (16%)	10(33%)	5(16%)
Ladnu	25	1 (4%)	5(20%)	3(12%)
Bikaner	20	Nil	2(10%)	1(5%)
Sindhri	50	3 (6%)	12(24%)	12(24%)
Bhoonka	30	5 (16%)	14(46%)	10(33%)
Over All	155	14 (9%)	43(27%)	31(20%)

The mean ELISA values have been found highly variable. The ELISA cut-off value was determined as

0.054 and this value was assumed from the control serum i.e from new born calf serum. Some of the samples showed higher antibodies level did not show any positive signals in PCR amplification. Other wise, all the 31 samples found positive in PCR amplification also showed higher mean ELISA Values. The animals which showed higher ELISA value but negative by PCR, are reflected by the fact of recent application of trypanocidal drugs which eliminated the parasites from the peripheral circulation but not the antibodies already produced in the system as reflected in ELISA. These animals may not have the active carrier state of infection.

The following table reflected the pattern of mean ELISA values of randomly collected sera samples of camels against trypanosomosis.

PCR amplification of RoTat 1.2 VSG gene of *Trypanosoma evansi* was carried in the present study. An amplicon of size about 448 bp specific to the RoTat 1.2 VSG gene of *T. evansi* was successfully amplified using the forward (5' GCC ACC ACG GCG AAA GAC 3') and reverse (5' TAA TCA GTG TGG TGT GC 3') primers. Besides, another amplicon of approximately 205bp of same RoTat 1.2 VSG gene has also been identified using the forward (5' GCG GGG TGT TTAAG CAA TA 3') and reverse (5'ATTAGT GCT GCG TGT GTT CG 3')primers.



Table 35: Mean ELISA values of sera samples against trypanosomes

A	0.053	0.059	0.185	0.190	0.185	0.196	0.228	0.250	0.126	0.117	0.223	0.231
B	0.068	0.059	0.120	0.138	0.130	0.128	0.214	0.238	0.072	0.086	0.104	0.132
C	0.085	0.087	0.109	0.105	0.062	0.074	0.139	0.156	0.066	0.076	0.257	0.254
D	0.083	0.079	0.127	0.144	0.108	0.103	0.078	0.082	0.072	0.073	0.087	0.079
E	0.097	0.092	0.054	0.061	0.076	0.072	0.080	0.089	0.088	0.076	0.091	0.089
F	0.127	0.126	0.136	0.120	0.066	0.061	0.076	0.078	0.073	0.076	0.068	0.065
G	0.118	0.117	0.094	0.102	0.054	0.071	0.071	0.073	0.035	0.048	0.056	0.061
H	0.089	0.079	0.121	0.135	0.164	0.199	0.103	0.105	0.034	0.044	0.061	0.069

Values indicated A1 and A2 are of new born camel calf serum.

PCR assays were able to detect evidence of infection in areas where parasitological techniques failed to do so. Furthermore, PCR assays provided evidence of infection in animals that were classified as uninfected by parasitological techniques suggests that PCR could have an important role to play in detection of infected animals harbouring a low parasitaemia.

Serological test best on antibody detection were included in the present study of trypanosome distribution. Although the results from this assay cannot be taken as absolute evidence of infection, the results were compared with those from PCR assays as part of the validation study. Antibodies to trypanosomes were found in samples from all the areas encountered, and in each case the proportion of sero positives was higher than that detected by PCR. 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.

The results from the parasitological, serological and PCR assays were used to obtain information in the distribution of trypanosome infection in camel in Rajasthan, Overall evidence from this study confirms trypanosome infection in camel is endemic.

Table 36: Examination of skin samples for mange (a) and GI parasites (b)

	No of samples collected	No of samples positive	Percentage
a)	27	9	33
b)	279	209	75

Mange infection as considered to be the second most important camel disease, in the present study also

33% samples found positive for the same due to *Sarcoptes* spp. Other samples duly collected in this regard might have reflected of different infection or cause.

The different types of infection recorded were mostly *Strongyles*, like *Haemonchus*, *Trichostrongylus*, *Nematodirella* / *Nematodirus* etc. Besides, *Strongyloides*, *Trichuris* infection are also noticed with lesser prevalence rate (2-6%) and very rare incidence of *Monezia* infection. The prevalence of GI helminth infection in different animal species solely depends on the geo-climatic conditions. The rainy to post rainy seasons were found suitable to maintain the fecundity of the parasites as well as the level of pasture contamination. In this hot arid climatic region, the infection of different helminth parasites in camel is also very prominent. It is also evident that the co-existence of camel with other live stocks like sheep and goat in these areas and wide migratory behaviour of these animals leads to much varied helminth infection in field conditions.

Sub-project - Epidemiology of viral diseases of camels

Sub-Project Leader: Dr. G.Nagarajan

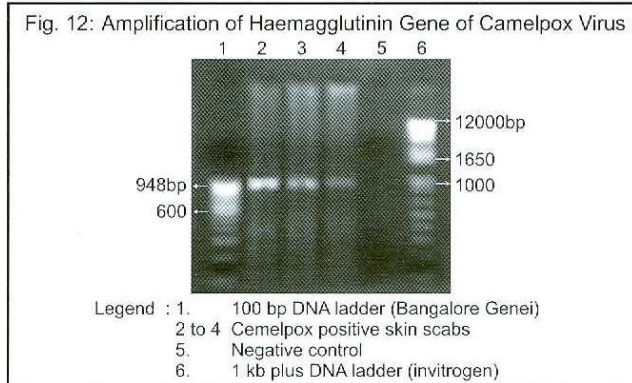
Blood samples were collected from about 28 Camels exhibiting the symptoms of Camel pox (from BSF of Bikaner). Skin scabs were also collected from the affected camels. Poxviral DNA was isolated from the skin scabs and PCR for the haemagglutinin gene of camel pox virus was carried out using the following set of primers.

Forward - 5' CGG TGG GGA TCCATG GCACGATTG TCAATA 3'

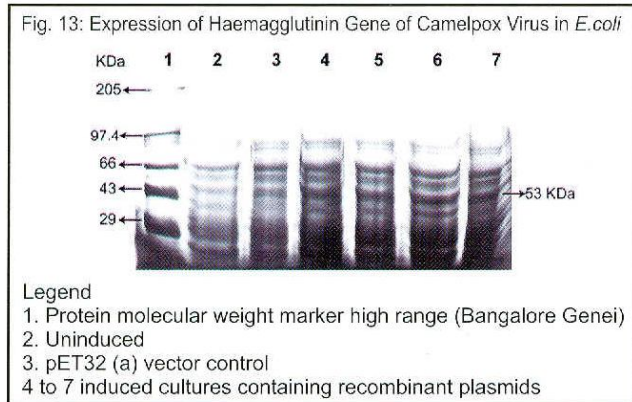
Reverse - 5' TGG CAG CTC GAG TTA TGT TTT GTA TTT ACG 3'



The amplicon was subsequently cloned at BamHI and Xho I sites of P^{ET32(A)} vector and expressed in *E. coli*. Optimal Mg²⁺ concentration and primer annealing temperature for the PCR reaction were 1.5 mM and 50 °C, respectively. An amplicon of size 948 bp was seen in agarose gels (Fig. 12) The concentration of IPTG used for the induction was 1 mM.



About 53 kDa sized protein was observed in the SDS-PAGE analysis of the lysate from the induced bacterial cells harbouring recombinant plasmids (Fig. 13).



Project : Epidemiology of deficiency/toxic and metabolic diseases in dromedary camel

Project leader : Dr. S.K. Dixit

Associate : Dr. D. Suchitra Sena

Randomly, a number of nearly 200 serum samples have been collected from camels of Bikaner, Hanumangarh, Churu, Barmer districts of Rajasthan in view to study the pattern/level of metabolic/deficiency disease if any, very little study is suggestive of non occurrence of ketosis. Lab analysis for other diseases is

in progress and therefore, no concrete conclusion could be drawn at this stage. A large scale study is proposed in coming years.

Project: Evaluation and validation of ethno-veterinary practices against camel diseases

Project leader: Dr. S.K. Dixit

Associates : Dr. F. C. Tuteja

In view to streamline ethno-veterinary medicines/practices in to main stream of therapy and to exploit naturally available resources as therapeutic agent and thus minimizing dependency of farmers on high tech driven technology, a three quarter study conducted for evaluation and validation of ethno veterinary medicines/ practices against camel diseases. The primary and little study is suggestive of that a majority of affections affect skin followed by digestive system, foot rot and nasal problem etc. where urban area farmers/ raikas prefer modern drugs and many of them are dependant on hospitals and/or on veterinarians. In rural areas for skin affections, kala tel, ash (burnt leather) with ghee is often used. For digestive disorders- ajwan with root of bui, -overnight soaked bajra extract, for foot rot-candle with sweet oil drops, Nasal problems- phenyl+heeng is used.

Project: Therapeutic spectrum of selected herbs against dermatophytes / bacteria

Project Leader: Dr. S.K Dixit,

Associates : Dr. F.C Tuteja and Dr. (Mrs.) D. Suchitra Sena

A series of desert plants) were screened in phases for their anticausal activity (*in vitro*) on dermatophytes (11 isolates)/ bacteria (9 Isolates). Few among them viz Giloi, Tulsi, babool etc were suggestive of their desired inhibitory effect on propogation of organism. Therapeutic spectrum of drugs can be increased many folds if they are enriched with immunopotentiating properties particularly in diseases of immunocompromised nature. In view to utilize double fold beneficial therapeutic effects of these plants, two oral formulations (OF I & OF II) comprising of plants as a whole or in parts (Table-37) were prepared after their processing in laboratory and their immuno-modulatory/ immuno-potentiating role was assessed experimentally on animals of NRCC in phases. Preliminary studies seem to be encouraging in phase II studies where oral



formulation OF II gave a marginal positive changes in the concentration of globulin level and A/G ratio (Table-38, 39) where as OF I (Table 40-41) failed to yield any satisfactory results.

Table 37: Plants used for formulation of drug

1.	Gawarpatha	pulp
2.	Giloy	Root stem
3.	Aswagandha	Root
4.	Amala	Fruit
5.	Gur	As excepiant
6.	Babool	Bark, leaves
7.	Khareri	Whole plant
8.	Shatawar	Bark
9.	Gokhru	Kanti
10.	Tulsi	Leaves

Table 38: Globulin conc.(g/dl)

S.No.	Days	Group I	Group II
1	0	2.019	2.486
2	5	-	2.096
3	10	-	2.931
4	15	-	3.685
5	30	3.22	3.028

Table 39: A/G ratio

S.No.	Days	Group I	Group II
1	0	1.691	1.343
2	5	-	1.416
3	10	-	1.096
4	15	-	0.9
5	30	1.211	1.143

Table 40: Globulin conc.(g/dl)

S.No.	Days	Group I	Group II
1	0	2.75	2.422
2	5	-	1.82
3	10	-	4.122
4	15	-	3.615
5	30	2.49	4.17

Table 41: A/G ratio

S.No.	Days	Group I	Group II
1	0	1.027	1.344
2	5	-	1.639
3	10	-	0.811
4	15	-	0.891
5	30	1.208	0.719

Project: Generation and validation of suitable formulation for treatment of mastitis

Sub-Project: To study the antimicrobial activity of plants for the development of alternative treatment for mastitis

Project leader : Dr. F.C. Tuteja

Associates : Dr. S. K. Dixit

The juice was extracted from herbal leaves viz Tulsi (*Ocimum sanctum*), Ashwagandha (*Withania somnifera*), Datura (*Datura metel*), Peepal (*Ficus religiosa*), Anar (*Punica granatum*), Pardesi kikar (*Prosopis juliflora*) collected locally from centre's campus. And vegetable herbs viz. Garlic (*Allium sativum*), Karela (*Momordica charantia*), Ginger (*Zingiber officinale*) procured from the local market. The crude juice was subjected to methanol extraction and stored in refrigerator till further use. Anti-bacterial activity was judged for crude juice methanol extract in isolates and groups on six isolates (3 Staph. aureus, 2 E.Coli and 1 Pseudomonas spp.).

Eight fungal isolates comprising *Aspergillus* spp (3), *Trichophyton* spp (2), *Microsporium* spp. (2) were tested for *in vitro* antifungal activity using antifungal assay agar by methanolic extract of Datura (*Datura metel*), Tulsi (*Ocimum sanctum*), Anar (*Punica granatum*), Peepal (*Ficus religiosa*), Pardesi kikar (*Prosopis juliflora*), Ashwagandha (*Withania somnifera*), Garlic (*Allium sativum*), Alovera (*Aloe barbadensis*).

Results revealed 100% sensitivity against crude and methanol extract of anar and pardesi kikar leaves.

Datura, ashawagandha and garlic were found to possess good antibacterial activity (Table 42). Synergistic effect was not observed with any combination.

On exposure to UV rays antibacterial activity of kikar and anar was not affected whereas all other plants failed to show any antibacterial activity (Table 43).

Maximum antifungal activity was exhibited by kikar (5/8) followed by anar (2/8) and garlic (1/8). Other plants failed to exhibit antifungal activity against the isolates tested (Table 44).



Table 42: Antibacterial sensitivity of crude juice and methanol extract of various plants

Bacterial isolates	No of isolates	Percent positive sensitivity of crude juice (CJ) and methanol extract (ME) of																	
		Tulsi leaves		Ashwagandha leaves		Datura leaves		Peepal leaves		Kikar leaves		Anar leaves		Garlic bulb		Karela fruit		Ginger root	
		CJ	ME	CJ	ME	CJ	ME	CJ	ME	CJ	ME	CJ	ME	CJ	ME	CJ	ME	CJ	ME
<i>Staph epidermidis</i>	34	35.29	2.94	100	88.23	94.11	100	0	2.94	100	100	100	100	82.34	23.52	38.23	20.58	32.35	0
<i>Staph aureus</i>	16	18.75	0	100	100	93.75	93.75	0	0	100	100	100	100	100	6.25	12.50	6.25	6.25	0
<i>Corynebacterium spp</i>	9	66.67	11.11	100	100	100	100	0	0	100	100	100	100	100	11.11	66.67	44.44	22.25	11.11
<i>Micrococcus spp</i>	4	50.00	0	100	100	100	100	0	0	100	100	100	100	100	0	75	50	0	0
<i>Bacillus spp</i>	5	80.00	20.00	100	100	100	100	0	0	100	100	100	100	100	20	80	40	80.00	20.00
<i>E.coli</i>	8	0	0	0	0	0	0	100	0	100	100	100	100	100	0	0	0	0	0
Overall	76	35.52	3.95	89.47	84.21	85.53	88.16	10.52	1.31	100	100	100	100	92.10	15.78	36.84	21.05	23.68	2.63

Table 43: Antibacterial activity after exposure to UV rays

Plant	Organism (no of isolates)			Total (6)
	<i>Staph aureus</i> (3)	<i>Ecoli</i> (2)	<i>pseudomonas</i> spp	
No of isolates found sensitive				
Datura	-	-	-	-
Anar	3	2	1	6
Peepal	-	-	-	-
Kikar	3	2	1	6
Tulsi	-	-	-	-
Ashawagandha	-	-	-	-
Garlic	-	-	-	-
Aloevera	-	-	-	-

Table 44: Anti fungal activity of methanolic extract

Plant	Organism (no of isolates)			Total (8)
	<i>Aspergill us</i> spp (3)	<i>Trichophyt on</i> spp (2)	<i>Microspor um</i> spp. (2)	
No of isolates found sensitive				
Datura	-	-	-	-
Anar	1	1	-	2/8
Peepal	-	-	-	-
Kikar	2	2	1	5/8
Tulsi	-	-	-	-
Ashawagandha	-	-	-	-
Garlic	1	-	-	1/8
Aloevera	-	-	-	-



Broad spectrum antibacterial activity along with mild antifungal activity was observed with anar and pardesi kikar leaves and garlic bulb. Whereas Datura and Ashawagandha leaves were found effective against G+ve bacteria.

Project: Investigations on digestion fermentation disorder with particular reference to indigestion and impaction

Project Leader : Dr. (Mrs.) D. Suchitra Sena,

Associates : Dr.G.Mal,Dr.S.K.Dixit and Dr. N. Sharma

A survey was conducted with 60 farmers and the incidence of digestive disorders was noted from the field. A total of 16 cases suffered from digestive disorders of simple indigestion, enteritis, impaction and chronic indigestion revealing a 26.22% incidence.

Under this project, the rumen fluid collection from camels was attempted which was a tedious task. The method of trocarisation of C₁ compartment might have untoward effects of developing peritonitis. So technique of rumen fluid collection through stomach tube by suction was standardized (Figures 14 and 15). The camels were sedated and the stomach tube was passed through the oesophagus to the C₁ compartment and the fluid was collected by suction for 1-2 minutes.

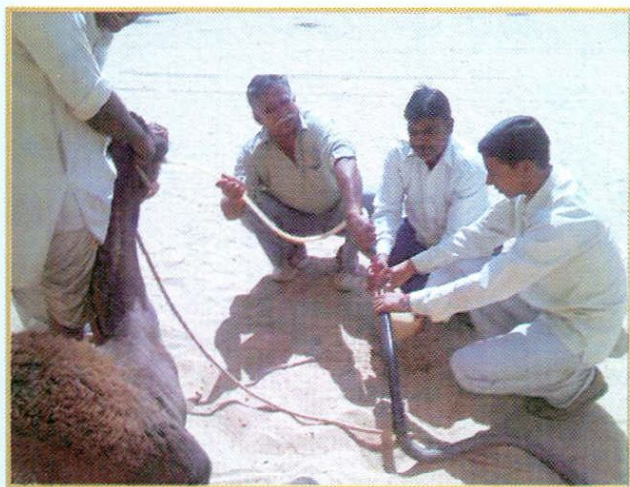


Figure 14: Collection of rumen fluid by Stomach tube through suction

After standardizing of the technique, the rumen fluid was collected from 3 camels. The physico-chemical and microbial studies were undertaken in the fresh rumen fluid as per standard defined protocols. The results of the rumen fluid analysis are shown in Table 45

as well as figures 16, 17, 18 to 24. The rumen fluid for biochemical studies was preserved and stored at -20°C. The rumen fluid for estimation of enzymes was fractionated and stored in aliquots at -20°C for further estimations. From one-postmortem case also rumen fluid was collected and the physico-chemical and microbial studies were undertaken and shown in Table 1 as well as Figures 17, 19, 21, 23 and 25. The sample was further preserved for biochemical and enzymatic studies.

The normal rumen fluid samples stained with different stains revealed *Ruminococcus albus*, a gram positive coccoid in singles/twos; *Ruminococcus flavefaciens*, a gram positive coccoid in two's and chains; *Selenomonas ruminantium*, a gram positive rods and certain gram positive bacteria in clusters. In the rumen fluid collected from a post-mortem case of indigestion there were no gram positive bacteria in clusters which suggests that these bacteria might be beneficial for maintaining the normal rumen physiology. Of course, cultural examination and identification of these bacteria has to be undertaken before concluding.

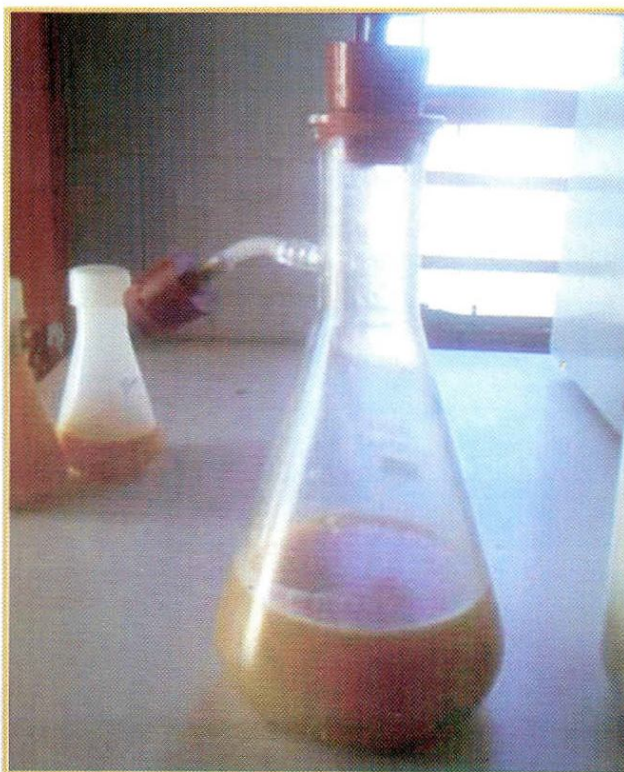


Figure 15: Rumen fluid collected in a suction flask



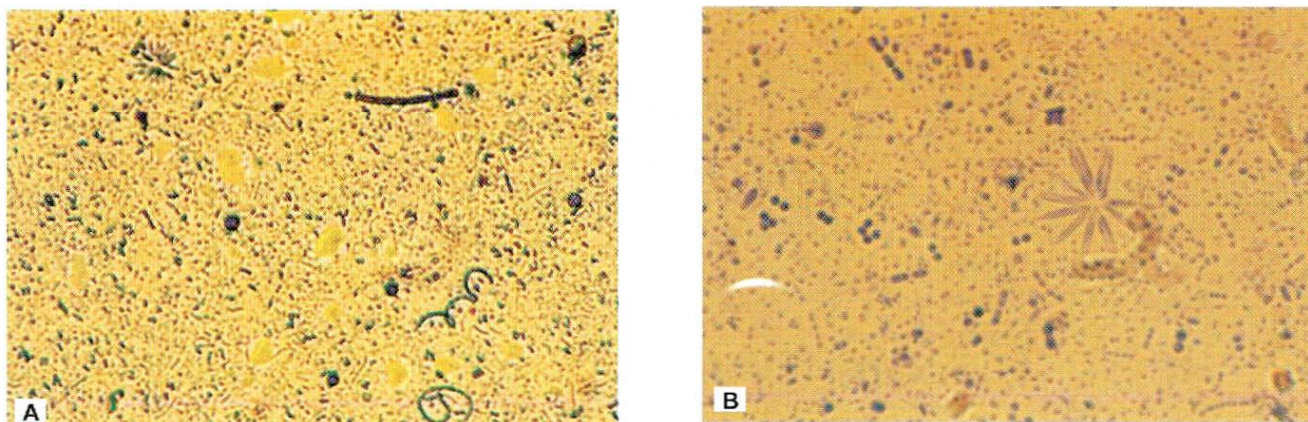


Figure 16: Normal rumen fluid stained with Methylene blue A) High power objective B) Oil immersion (*Ruminococcus albus*; *Ruminococcus flavefaciens* and bacteria in clusters)

Table 45: Physico-chemical, biochemical and microbial changes of rumen fluid in different animals

S.No.	Parameters	Animal 1	Animal 2	Animal 3	Animal 4*
A.	Physico-chemical				
1.	Odour	Aromatic	Aromatic	Aromatic	Slightly acidic
2.	Colour	Brownish grey	Brownish grey	Brownish grey	Brownish yellow
3.	Consistency	Slightly viscous	Slightly viscous	Slightly viscous	Watery
4.	Cellulose Digestion Time (Hours)	< 36	< 36	< 36	>48 hr
5.	Sedimentation Activity Time (minutes)	4	3	3	4
6.	Methylene Blue Reduction Time (minutes)	6	8	7	13
7.	Volume % (Solid phase, liquid phase)	2.6/7.4	2/8	2.5/7.5	3.5/6.5
B.	Bio-chemical				
1.	pH	7.4	7.0	7.2	6.6
2.	Total acidity (Units)	30	34	42	64
C.	Microbial Count				
1.	Motility of rumen protozoa	+++	+++	+++	+
2.	Total protozoal count (x 10 ⁵ /ml)	2.04	1.68	1.82	0.98
3.	Iodophilic activity of rumen protozoa	+++	+++	+++	+
4.	Total bacterial count (x 10 ⁸ /ml)	9.9	7.6	8.5	10.2

* indicates rumen fluid collected on post-mortem from camel



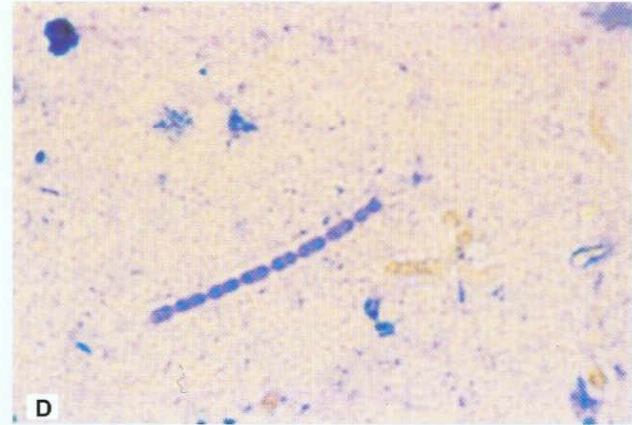
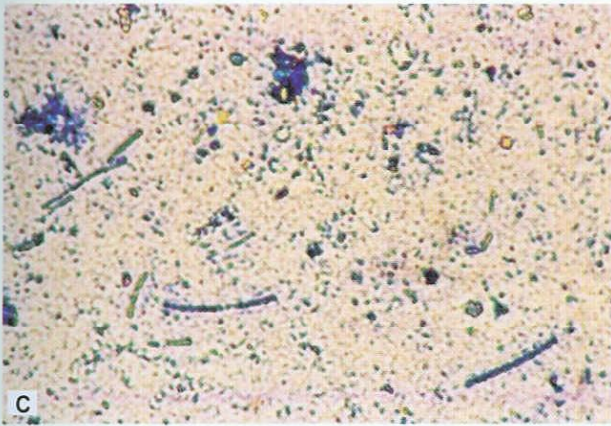


Figure 17: Rumen fluid collected on post-mortem stained with Methylene blue C) High power objective D) Oil immersion (*Ruminococcus albus* and *Selenomonas ruminantium*)

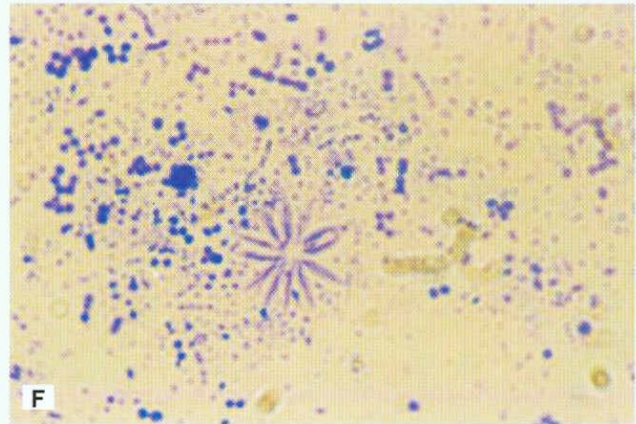
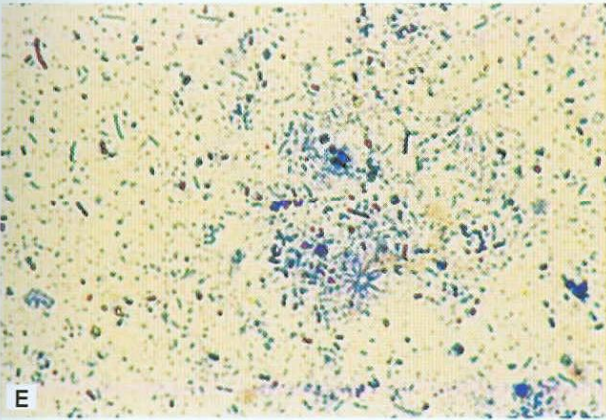


Figure 18: Normal rumen fluid stained with Crystal Violet E) High power objective F) Oil immersion (*Ruminococcus albus*; *Ruminococcus flavefaciens*, *Selenomonas ruminantium* and in clusters)

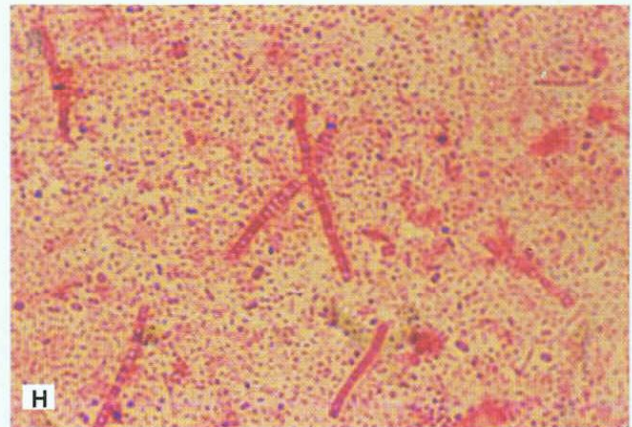
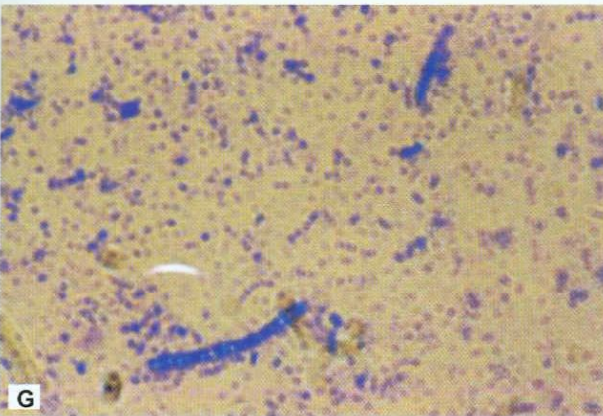


Figure 19: Rumen fluid collected on post-mortem seen under Oil immersion stained with G) Crystal Violet H) Carbol Fuchsin (*Ruminococcus albus* and *Ruminococcus flavefaciens*)



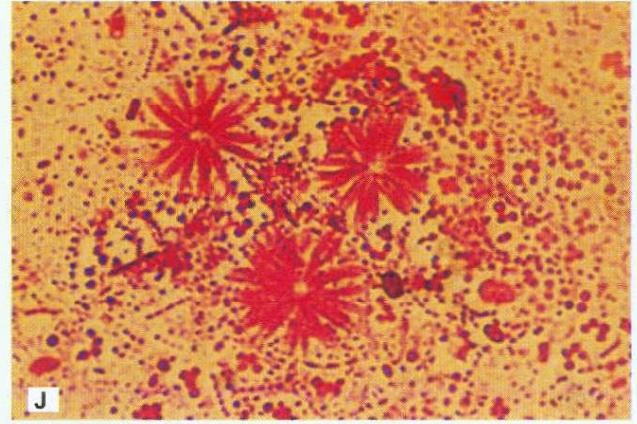
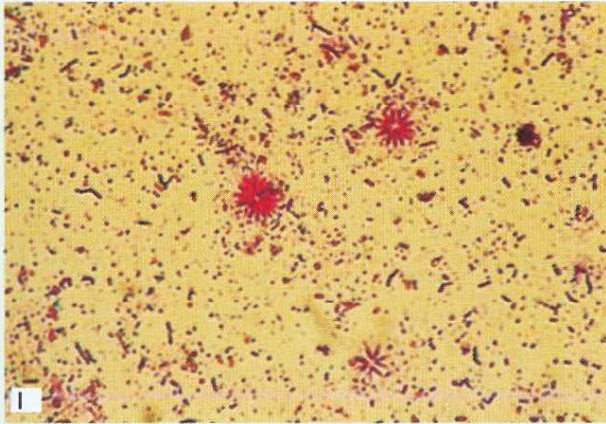


Figure 20: Normal rumen fluid stained with Carbol Fuchsin I) High power objective J) Oil immersion (*Ruminococcus albus*; *Ruminococcus flavefaciens* gram positive bacteria in clusters)

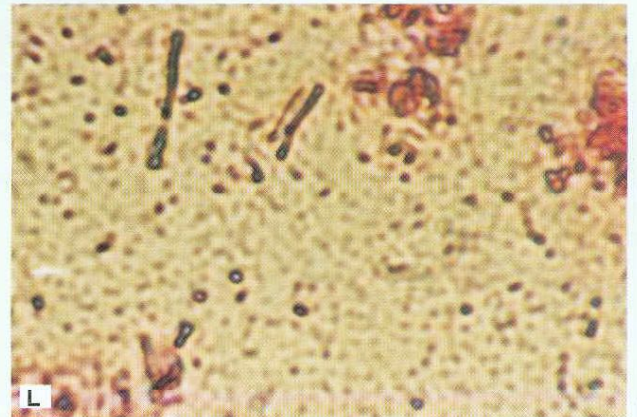
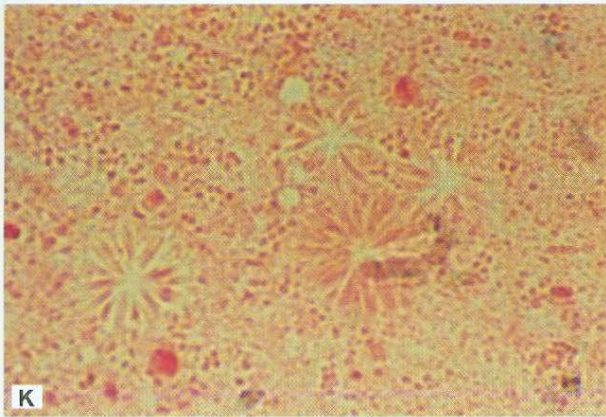


Figure 21: Gram's staining of rumen fluid under oil immersion K) Normal (*Ruminococcus albus*; *Ruminococcus flavefaciens* and gram positive bacteria in clusters) L) Post-mortem (*Ruminococcus albus* and *Ruminococcus flavefaciens*)

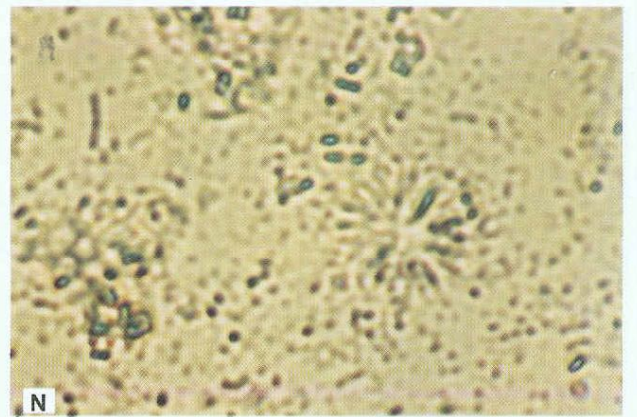
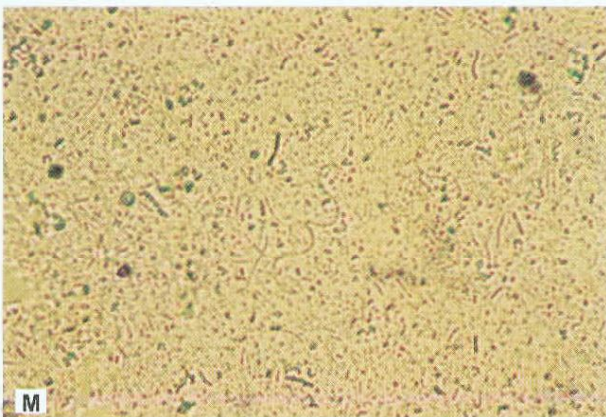


Figure 22: Normal rumen fluid stained with Nigrosine M) High power objective N) Oil immersion (*Ruminococcus albus*; *Ruminococcus flavefaciens* and gram positive bacteria in clusters)



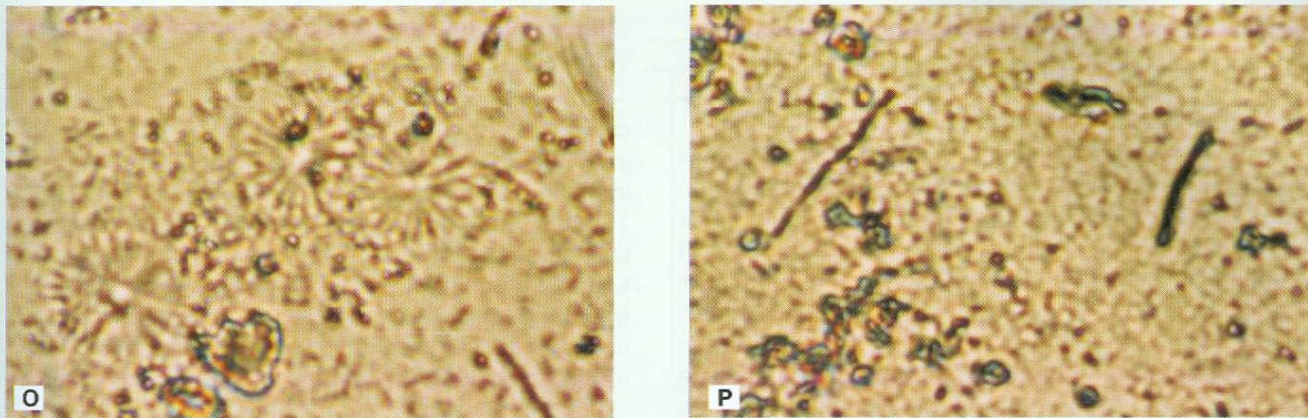


Figure 23: Nigrosine staining of rumen fluid under oil immersion O) Normal (*Ruminococcus albus*; *Ruminococcus flavefaciens* and gram positive bacteria in clusters) P) Post-mortem (*Ruminococcus albus* and *Ruminococcus flavefaciens*)

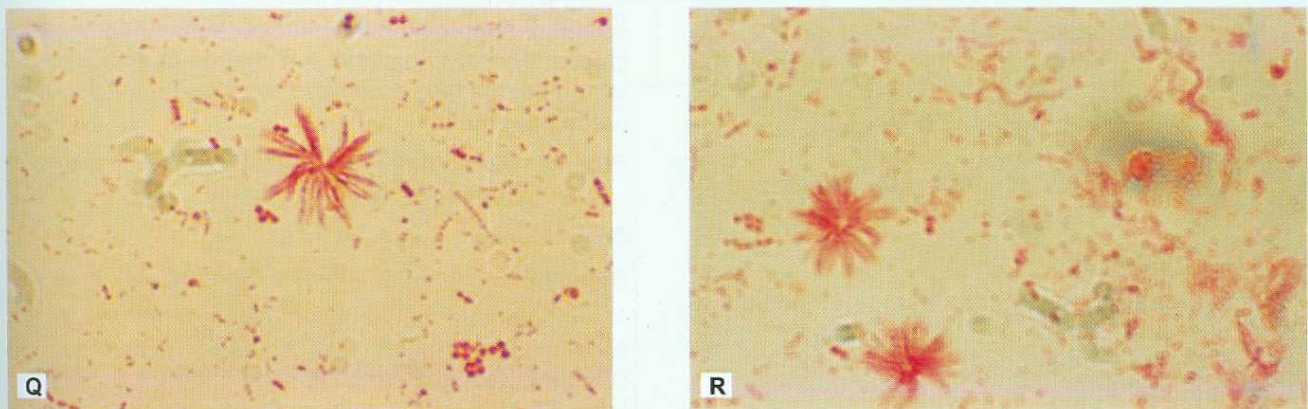


Figure 24: Formalized normal rumen fluid stained with Gram's stain Q & R) High power objective (*Ruminococcus albus*; *Ruminococcus flavefaciens* and gram positive bacteria in clusters)

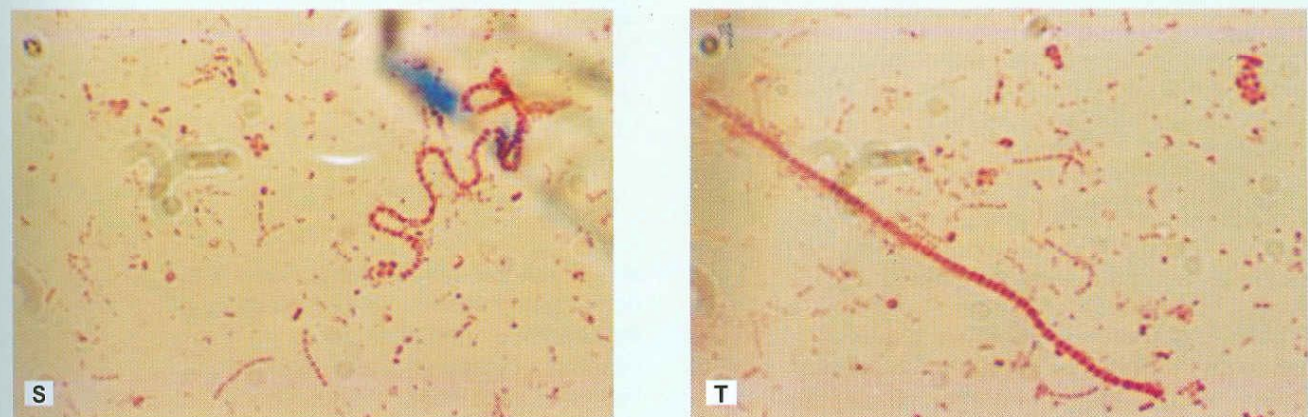


Figure 25: Gram's staining of rumen fluid under oil immersion S & T) Post-mortem (*Ruminococcus albus* and *Ruminococcus flavefaciens*)



Project: Immunity status in neonatal camel calves

Project Leader : Dr. (Mrs.) D. Suchitra Sena

Associates : Dr. G. Mal and Dr. S. K. Dixit

Sheep anti-camel immunoglobulins were produced and the cross reactivity was checked with Double immunodiffusion and the protocol of SRID was standardized for the estimation of camel Immunoglobulins. In a total of 18 camel milk/colostrum samples, whey was separated by high-speed centrifugation and the estimation of camel whey Ig's was carried out using single radial immunodiffusion. The results of colostrum/milk whey immunoglobulins are presented in Table 46. The trend of whey immunoglobulin variation from 0 hr to 3 months duration is shown in Fig.26.

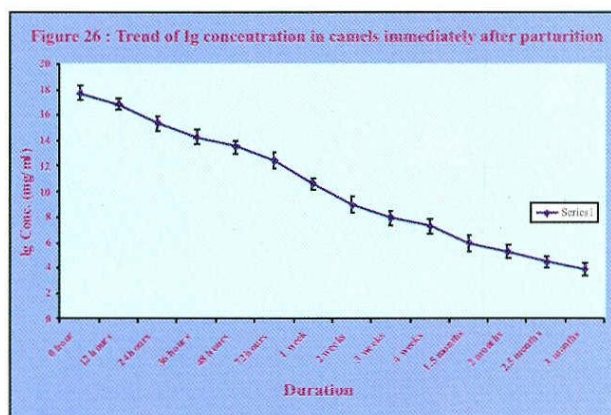


Table 46: Mean±SEM of colostrum/ milk whey immunoglobulins in dams at different intervals after parturition

S. No.	Duration	Ig concentration (mg/ml)
1.	0 hour	17.72±0.56
2.	12 hours	16.82±0.46
3.	24 hours	15.37±0.58
4.	36 hours	14.28±0.57
5.	48 hours	13.51±0.53
6.	72 hours	12.42±0.67
7.	1 week	10.62±0.47
8.	2 weeks	8.96±0.65
9.	3 weeks	7.94±0.60
10.	4 weeks	7.27±0.59
11.	1.5 months	5.96±0.67
12.	2 months	5.29±0.49
13.	2.5 months	4.48±0.47
14.	3 months	3.89±0.49

Effect of oral immune-modulators in pregnant camels

An experiment was conducted in 10 pregnant camels in last trimester of pregnancy. All camels were given standard and similar feeding. Group I was fed with immune-modulator Restobal @50ml per os bid daily for 10 days, while the Group II served as control. Blood samples were collected before start of trial i.e., on day 0 and after feeding (day 11) and on day 21 in both the groups. Serum was separated and the protein profile, urea and bilirubin contents were estimated. The results of the mean and SEM of the protein profile, urea and bilirubin are presented in Table 48.

After parturition in both the groups the body weight changes as well as average growth rate (AGR) at fortnight intervals were recorded and shown in Table 49. There was non-significant variation in the body weights as well as average growth rate between days in both the groups. There is no significant change or improvement after feeding of immunomodulator (Restobal- Dabur) in pregnant camels.

Project : Molecular Cloning and Characterization of Cameline Cytokine Gene(s)

Project Leader : Dr.G. Nagarajan

Associates : Dr.S. K. Ghorui and Dr.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 Interferon-Gamma gene using the following set of primer was attempted.

Cam IFN-G-F 5 "GCGG GGA TCC ATG AAT TAT ACA AGT TAT

Cam IFN-G-R 5" CGG GAA TTC TTA CTT CGA CGC TCT CCG

It was revealed that Con A at the concentration of 5 µg / ml was found to be optimum for the stimulation of cameline peripheral blood mononuclear cells for the various cytokine gene expression. Optimal Mg⁺² concentration and primer annealing temperature for the PCR reaction were 1.5 mM and 49 ° C, respectively. An amplicon of Size 560 bp was seen in agarose gels. (Fig. 27)



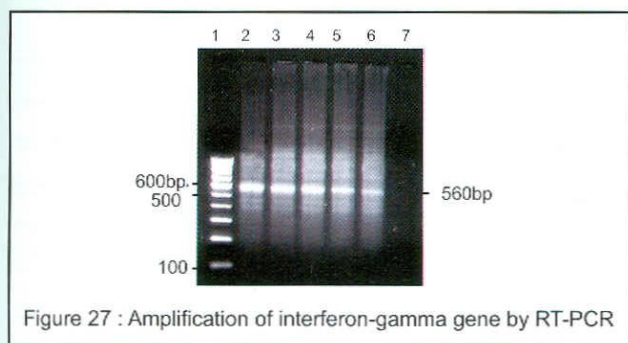
Table 48: Mean±SEM of biochemical profile in pregnant camels (last trimester) of different groups

S. N.	Parameter	Group I			Group II		
		Day 0	Day 11	Day 21	Day 0	Day 11	Day 21
1.	Total Protein (g/dl)	6.26±0.07	6.00±0.13	5.86±0.13	6.40±0.14*	5.83±0.07*	5.77±0.12*
2.	Albumin (g/dl)	3.08±0.04	2.94±0.06	2.86±0.07	3.15±0.07*	2.87±0.03*	2.83±0.14*
3.	Globulin (g/dl)	3.18±0.03	3.06±0.06	3.00±0.06	3.24±0.07*	2.96±0.04*	2.94±0.05*
4.	A/G ratio	0.96±0.00	0.95±0.00	0.95±0.01	0.97±0.00	0.97±0.00	0.96±0.00
5.	Total bilirubin (µmol/L)	3.43±0.45	2.64±0.28	3.19±0.50	4.55±0.52	4.22±0.29	3.55±0.56
6.	Direct bilirubin (µmol/L)	0.13±0.06	0.05±0.01	0.16±0.09	0.102±0.05	0.13±0.03	0.22±0.05
7.	Urea (mg/dl)	39.40±3.17	36.46±4.85	37.42±3.38	28.17±2.61	30.48±2.79	26.69±3.21

*(P<0.05) Significant at 5% level.

Table 49: Mean±SEM of body weight as well as AGR in camel calves of Group I and Group II camels

S. No	Group	Body weight (Kg)			Average growth rate (Kg)	
		Day 0	Day 15	Day 30	Birth-15 days	15-30 days
1.	Group I (N=4)	42.00±2.73	50.50±2.39	56.5±3.06	8.50±2.46	6.00±1.58
2.	Group II (N=5)	45.00±1.70	55.00±1.41	63.4±1.96	10.00±2.25	8.4±1.60



Unit: Camel Management

Project: To study the economics of different camel management practices under arid and semi-arid eco-system

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

Project leader : Dr. Champak Bhakat

Associates : Dr. N. Saini and Dr. K.M.L. Pathak

Ten camel calves belong to 17 - 21 months age are divided into two comparable groups containing 5 calves (3 males + 2 females) in each group. First group is reared under intensive system of management and the second group is reared under semi-intensive system of management.

The comparative average total body weight gain is found to be higher in semi-intensive management

(122.80 kg) than intensive management (92.70 kg) after 365 days. The average growth rate significantly ($P<0.01$) varies between groups for both types of management practices. The total intake / day /Kg metabolic body size for intensive group is $0.089 \text{ kg} \pm 0.007 \text{ kg}$ for 1st practice and $0.087 \text{ kg} \pm 0.006$ for 2nd practice. The average fodder intake from manger is slightly higher in first group than second group.

The economic analysis of rearing of camel calves in two system of management is given in table 50. The total cost for per kg body weight gain is less and economical for both 1st and 2nd practices in semi-intensive management than intensive management system.

Table 51 represents the body composition of camel calves in different management system. Body water, fat protein, ash significantly ($P<0.05$) varies between groups. Nutrient and energy deposition significantly at higher level in semi-intensive management than intensive management group.

The comparative biometrics of camel calves in different system of management reveals that body length, heart girth, height at wither, hump circumference horizontal, neck length, leg length (front & hind), foot pad length (front) are significantly ($P<0.01$) increased in second group as compared to first group. Few biometrical parameters viz: hump circumference vertical, footpad width (front), foot pad length (hind) varies significantly ($P<0.05$) and other parameters viz: foot pad width (hind) varies non-significantly.



Table 50: Economic analysis of rearing of camel calves in different management practices

	Intensive system of Management			Semi-intensive system of Management		
	1 st Practice G.C.R	2 nd Practice M.C.R	Overall Total	1 st Practice G.C.R	2 nd Practice M.C.R	Overall Total
Total feeding cost for each practice (Rs / calf)	2525	2811	5336	2139	2415	4554
Total feeding cost (Rs / day / calf)	14.02	15.61	14.61	11.88	13.11	12.47
Total cost (Rs) / Kg gain	48.21	30.32		34.46	19.67	

M.C.R : Moth crop residue (*Phaseolus aconitifolius*), G.C.R : Guar crop residue (*Cyamopsis tetragonoloba*).

Table 51: Body composition of camel calves in different management system

Parameters	Intensive system of Management		Semi-intensive system of Management
% Body composition			
Body water	71.65 ± 0.31	*	70.64 ± 0.37
Body fat	4.87 ± 0.27	*	5.77 ± 0.33
Body protein	20.32 ± 0.09	*	20.03 ± 0.11
Body ash	3.15 ± 0.15	*	3.56 ± 0.25
Nutrient deposition (Gm/day)			
Protein deposited	34.56 ± 2.05	**	56.07 ± 2.73
Fat deposited	7.79 ± 0.44	*	9.23 ± 0.53
Energy deposition (Kcal/day)			
Protein	194.21 ± 11.53	**	315.10 ± 15.39
Fat	72.92 ± 4.13	*	86.39 ± 4.96
Total deposition	267.12 ± 11.63	**	401.49 ± 17.08

* Significant at 5 % level, ** Significant at 1 % level

Sub-project: Studies on socio-economic scenario of camel husbandry at newly adopted villages

Project leader: Dr. Champak Bhakat

Associates : Dr. (Mrs) N. Saini and Dr. K.M.L. Pathak

A study was carried out on pre-tested survey proforma by participatory approach. Necessary data were collected from 174 camel keepers. Socio-economic aspects were studied from 11 new villages viz: Karmisar, Bachchhasar, Bastichauran, Sawrupdesar, Kolasar, Meghasar, Bhojusar, Akasar, Bholasar, Chandasar, Salasar of Bikaner district.

Most of the respondent (42%) were of old age (>56 year) category followed by 37 % middle age (36-55 year) and 21 % young age (< 35 year). The 30 % of camel keeper are literate, 34 % functionally literate and

36 % reported themselves as illiterate in this study area. Maximum (63 %) respondents are having medium size household (4-6 members) followed by 16 % large (7-9 members), 12 % very large (10 members & above) and 9 % small size (1-3 members). Camel rearing practices adopted in study areas is presented in table 52. The chi square test indicates that number of camel significantly ($P<0.01$) influences rearing practices in these areas. Most of respondents are having ownerships as camel keeper (72.42 %) whereas 27.58 % of respondents are reported themselves of having ownership as camel merchant. The purpose of camel rearing in different types of ownership is given in table 53. The spearman's correlation test indicates that purpose of camel rearing significantly ($P<0.01$) influenced by different types of animal ownership in these region.



Table 52: Camel rearing practices (%) adopted in study areas

Camel Number	Intensive	Semi-Intensive	Extensive	G T Overall
1	82.67	10.66	6.67	43.10
2 - 3	33.82	52.94	13.24	39.08
> 3	19.35	25.81	54.84	17.82
Overall G. T	52.30	29.89	17.81	
Chi Square	75.54 **			

Table 53: Purpose of camel rearing in different types of ownership

No	Purpose	Camel Keepers		Camel Merchants	
		M.S.V	Rank	M.S.V	Rank
1	Carting	6.78	I	5.30	III
2	Farming Use	6.10	II	4.50	IV
3	Trading	2.30	VI	6.20	I
4	Pack Loading	4.80	III	2.80	V
5	Riding	3.75	IV	6.00	II
6	Safari	3.40	V	1.20	VII
7	Others	1.50	VII	2.40	VI
Spearman's correlation		r = 0.18** mail.nm			

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

Project leader : Dr. Champak Bhakat

Associates : Dr. (Mrs.) N. Saini and Dr. K.M.L. Pathak

Health Camps :

The health camp was organized at village Meghasar on 17.12.07. The mobile health camp on camel and sheep was organized on 22.1.08 at Bachhasar, Bastichawaran, Meghasar. Door to door health care services were provided to villages (*Karmisar, Bachchhasar, Bastichauran, Sawrupdesar, Kolasar, Meghasar, Bhojuser, Akasar, Bholasar, Chandasar, Salasar*) on 15.12.07. A total number of 196 camels and 600 sheeps were treated and distributed medicines, handouts at free of cost.

Scientific Exhibitions :

During the year two exhibitions are organized at out campus. Viz: 1. Camel Festival at Bikaner on 22.1.08, Theme "Camel products and technology" 2. Ramdev Camel fair, Nagour on 13.2.08. Theme -

Utilization of value added products and technology" These are depicting technologies developed by the centre.

Transfer of technical knowledge:

Attempt was made to transfer the technical know how of electricity generation by camel bio-energy. Efforts were made to popularize the technical know how of preparation of camel milk products to field level through various approaches. Flavored milk, tea/coffee, Kulfi of camel milk was provided to various national and international visitors.

Demonstrations / practical trainings :

The demonstrations / practical trainings are provided to various group of farmers viz: 23 farmers from NGO L.P.P.S. Sadri, Pali on 14.3.08, 40 farmers from M.H.S.C TRUST, Jodhpur on 3.5.07, 30 farmers from Krishi Vistar, Jhunjunu on 13th -15th sept'07, 190 farmers from NGO Desura Dashak Project, Bap, Jodhpur on 17.11.07, 19 farmers from Krishi kisan kalian & krishi vikas, Ujjain, M.P on 13th 14th Mar' 08.

Farmer's meets / kissan gosthies:

Three farmer's meet / kissan gosthies are conducted viz: at Meghasar village on 15.12.07, at Karni singh stadium on 22.1.08 and at NRCC on 23.2.08. During the gosthi camel keepers are apprised about advance camel diseases, modern management practices followed at an organized farm.

Participation in Camel competitions etc:

The centre participated and awarded for various competitions at Camel Festival-08, viz.: milking competitions, newly born camel calf, camel decoration etc.

Revenue generation programme:

All efforts are made to strengthen the revenue generation and sizeable amount of revenue are generated through various possible extension activities viz: entry fee, still photography, camel riding etc. Camel museum has been made much more scientific and informative which attract more number of tourists and generate more revenue for our centre.

Unit: Camel Nutrition

Project: Studies on nutrient requirement and feed resource availability in camel for optimum production

Project Leader : Dr. A.K. Nagpal

Associates : Dr. A. K. Roy, Dr. B.L. Chirania



Sub project: Effect of variation in the dietary protein levels on growth performance of camel calves in the age group of 1-3 years

The experiment was conducted on 14 camel calves for 259 days from 16th July 2007, 31st March, 2008 to assess the effect of different dietary protein levels on their growth performance. Fourteen healthy male camel calves of Bikaneri, Kutchchi and Jaisalmeri breeds of 1 year of age were divided into 3 groups. Group I (GpI) of 5 camels was fed complete feed blocks (CFB) containing 9.5 %CP, group II (GpII) of 5 camel calves was fed CFB diet having 12.09%CP and group III (GpIII) of 4 camel calves was fed CFB diet having 14.45% CP. The TDN level was almost same in 3 diets and varied between 59.25 to 62.50%. The physical composition of Gp I diet consisted of guar phalgati 67, groundnut haulms 20, bajra 8, guar churi 4, mineral mixture 0.2 and common salt 1.0%. The composition of Gp II comprised of guar phalgati 59, groundnut haulms 20, bajra 8, guar churi 12, mineral mixture 0.2 and common salt 1.0%. The diet of Gp III comprised of guar phalgati 51, groundnut haulms 20, bajra 9, guar churi 19, mineral mixture 0.2 and common salt 1.0%. All the camels were reared on sandy floor and fed *ad-libitum* respective rations individually at stall. Daily record of feed intake was maintained. Camel calves were weighed at monthly intervals.

The initial body weight of the animals of Gp I, Gp II and Gp III were 294.60±10.23 kg, 287.40±17.47 kg and 291.00±13.82 kg respectively (Table 54). Average daily gain (kg/d) did not differ significantly (P<0.05) among groups but was higher in GpIII (0.436±0.02) than in Gp II (0.385±0.02 and Gp I (0.346±0.02) which might be due to higher nutrient intake. Dry matter intake kg/kg body weight gain was minimum of 13.95 in Gp III followed by 15.25 in Gp II and maximum in Gp I (16.62) indicating higher feed efficiency in GpIII.

The average intake of dry matter intake (DMI) kg/d or kg/100 kg body weight or g/kg body weight^{0.75} was 5.77±0.15, 1.70±0.03 and 72.98±1.09 respectively in Gp I. These values were 5.93±0.08, 1.77±0.07 and 75.68±2.26 in Gp II and 6.06±0.06, 1.75±0.07 and 75.49±2.10 in Gp III respectively. Average daily intake (calculated) of CP(g), TDN (kg) and ME (MJ) of Gp I were 0.545±0.01, 3.42±0.09 and 51.47±1.37 respectively. These values were 0.717±0.01 3.61±0.05 and 54.33±0.69 respectively in group II and 0.876±0.01, 3.79±0.04 and 57.05±0.56 respectively in Gp III (Table 54). The results indicated higher potential of body weight

gain (436 g/d) in yearling camel calves fed diet containing 14.50% crude protein and 62. Digestibility trials will be conducted on camel calves to determine the actual nutrient intake.

Table 54. Growth and feed efficiency of camel calves

Groups	GpI	GpII	GpIII
No. of camels	5	5	4
Initial BW kg.	294.60±10.23	287.40±17.47	291.00±13.82
Final BW kg	384.20 ±12.76	387.20 ±16.62	404.00±9.68
Total gain kg	89.60 + 5.73	99.80 + 6.27	113.00±4.40
Av. daily gain g	0.346±0.2	0.385± 0.02	0.436±0.02
Total DMI kg	1493.66±39.88	1535.14±19.46	1569.50±15.35
DMI kg/kg gain	16.62±0.86	15.25±1.15	13.95±0.56
Cost of feed Rs/q	301.95	341.15	380.2
Cost Rs/kg gain	50.18	52.02	53.04

Project: Studies on digestive fermentation pattern in locally available camel feed and fodder

Project Leader : Dr. (Mrs) Nirmala Saini

Associate : Dr. Gorakh Mal

Locally available commonly fed basal feed, browsed trees leaves, shrubs and bushes were analyzed for proximate principle, cell wall composition and *in vitro* DM digestibility. Among straws, higher digestibility was recorded in moth straw (53.75%) and lowest in gram straw (40.88%) whereas, in tree leaves neem (50.48%) had highest *IVDMD* and sesame (31.1%) had lowest. In grasses, lana had 50.0 % *IVDMD* and ganthia had lowest *IVDMD* 21.74%. The *IVDMD* of shrubs and bushes ranges from 29.73 % in phog to 37.90 % in pala.

Studies with rumen liquor collected before and after 4 & 8 hrs of feeding of clusterbean straw showed significant (p<0.01) decreased in pH from 7.19 at 0 hr to 6.38 at 8 hr with concurrently increased in TVFA and TCA ppt N. The values of rumen NH₃-N level at different hrs ranged from 6.99 to 8.25 mg %. The concentration of total VFA observed at 0 hr was 17.90 meq/100ml SRL which increased significantly (p<0.01) up to 30 meq/100ml SRL at 8 hr. Contrarily, total N was significantly higher at 0 hrs compared to 4 and 8 hrs. Soluble N was significantly low at 8 hrs and which may be due to more absorption of soluble nitrogen through ruminal wall. Molar percent of acetic acid, propionic acid and butyric acid with clusterbean straw varied from 57.84-61.26 & 22.22- 27.21 & 14.08- 16.88 respectively at 0, 4 & 8 hrs.



Table 55. Chemical composition and IVDMD (percent DM basis)

S.No.	Feed	CP	EE	NDF	ADF	NFE	IVDMD
Crop residues							
1	Moth	11.55	1.57	49.00	27.00	60	53.75
2	Guar	6.16	1.85	38.0	33.20	45.16	44.92
3	Gram	5.79	2.98	47.00	29.90	57.5	40.88
4	GN	10.39	4.10	49.7	33.90	54.46	50.92
5	Moong	9.80	1.46	30.20	16.57	55.22	42.52
Tree leaves							
6	Khejari	13.85	2.74	49.3	29.70	47.31	32.70
7	Jaal	15.43	1.15	25.00	14.10	57.53	35.74
8	Neem	12.95	4.95	32.00	27.40	55.27	50.48
9	Sesam	15.60	1.43	43.95	31.90	54.69	31.10
Grasses							
10	Gramma	9.20	1.72	76.36	31.54	62.24	49.60
11	Lana	9.89	1.77	45.56	28.40	60.74	50.30
12	Dhaman	6.30	0.56	68.08	37.76	53.31	40.10
13	Ganthia	7.35	1.11	68.66	48.00	62.7	21.74
Shrubs/bushes							
14	Pala	12.95	2.77	34.72	19.31	59.45	37.90
15	Ker	5.95	1.57	52.24	38.90	55.15	31.52
16	Phog	8.05	3.36	40.96	31.10	64.09	29.73
17	Bui	7.35	1.27	47.00	44.26	41.41	33.49

Table 56. Ruminal parameters

Parameters	0 hr	4hr	8 hr	SEM
pH**	7.19 ^a	6.5 ^b	6.38 ^b	0.02
NH ₃ N (mg %)	8.25	7.21	6.99	0.66
TVFA (meq/100ml SRL)**	17.90 ^a	21.52 ^a	30.0 ^b	1.09
N fraction (mg %)				
Total N **	214.83 ^a	144.67 ^b	115.51 ^b	9.57
Soluble N **	8.0 ^a	8.5 ^a	3.57 ^b	5.58
TCA ppt. N	206.8	136.1	111.94	25.57
VFA fraction molar % basis				
Acetic acid	57.84	61.26	57.58	1.01-
Propionic acid	25.22	22.22	27.21	0.82
Butyric acid	16.88	14.08	16.87	0.75
A:P ratio	2.29	2.75	2.12	-
Non glucogenic ratio	3.36	4.02	3.35	-

** Different superscript in a row differ significantly at P<0.01



AICRP on "Improvement of Feed Resources and Nutrient Utilization in Raising Animal Production"

Project leader: Dr. Nirmala Saini

Associates: Dr. B.D. Kiradoo, N. Singh (up to 31.3.2008)

Effect of mineral supplementation on production performance of dromedary camels

After assessing the micronutrient deficiency in different agro climatic zones of semi arid western regions of Rajasthan, area specific mineral mixture was formulated. 8 dromedary camels of Bikaneri breed of average milk yield (5-6 lit/d) and body weight (606.50 vs. 596.25 kg) at their mid stage of lactation were kept on 2 feeding regimes. Group I were offered cluster bean straw as a source of dry roughage under traditional system. Whereas, camels of group II were fed 2 kg concentrate mixture along with formulated mineral

mixture @ 50 g/d under intensive system up to 76 days. Intake of cluster bean straw was lower in group II (10.12 kg) than group I (11.40 kg) due to concentrate feeding. But, dry matter intake as per kg metabolic body weight ($g/kg^{0.75}$) was significantly ($p < 0.05$) higher in group II compared to group I.

Intake of Ca in both groups was found within the required level i.e. 0.43 to 0.77%. Moreover, Ca & P ratio was 4.86:1 in group I against the optimum level of either 2:1 & 1:1. Similarly, intake of Mg and Mn was adequate and Fe was in excess with straw feeding in group I. The intake of Cu & Zn was low in group I (7.17 & 20.32 ppm). Thus the average daily intake of all the micronutrients was obviously low in group I fed straw alone as a sole diet and requires supplementation of concentrate & mineral mixture. (Table 58).

Table 57 : Chemical Composition of experimental feeds

Feeds	% (percent)							ppm			
	DM	OM	Ash	AIA	Ca	P	Mg	Cu	Zn	Fe	Mn
Cluster bean straw	94.46	88.11	11.89	6.42	0.73	0.15	0.44	7.17	20.32	498.4	52.25
Conc.	92.48	87.02	12.98	6.50	1.98	1.72	0.58	50.0	42.00	290.0	59.00
Mineral mixture	-	-	-	2.50	22.04	17.50	-	0.08%	1.6%	-	0.12%

Table 58 : Average daily intake of micronutrients in different dietary groups (gm or mg/animal/day)

Attributes	Through straw							
	kg/d	g/d			mg/d			
	DMI	Ca	P	Mg	Cu	Zn	Fe	Mn
G1	11.40	83.24	39.91	50.17	81.76	231.70	5682.97	595.78
G2	10.12	73.85	35.41	44.51	72.54	205.37	5642.24	528.69
Through concentrate								
G2	1.86	36.76	31.94	10.77	92.84	77.99	538.47	109.55
Through mineral								
@ 50 g/d	0.05	11.02	8.75	-	40	800	-	140
Total mineral intake								
	%	% level in DM consumed			mg/kg			
	DMI	Ca	P	Mg	Cu	Zn	Fe	Mn
G1	11.40	83.24	17.1	50.17	81.36	231.70	5082.97	595.78
G2	12.02	121.64	55.79	55.28	205.38	1083.56	5580.70	778.16
Recommended level								
Mc Donald (1980)	-	0.43 - 0.77	0.25 - 0.49	0.20 - 0.25	10.00	40.00	50 - 100	40.00



Performance of dam and calves

Milk production was more in groups II (6.11 lit./d) than group I (5.37 lit./d) due to feeding of balanced nutrients. The total milk production over 76 days recording was 408.34 & 463.63 lit., respectively in group I & II. The initial body weight of group I was 606.50 kg and at the end of study period (30 d) was 591.50 kg with a loss of body weight 500 g/d. While camels of group II, gained on an average of 16.75 kg weight with daily gain of 500g/d. Similarly, the total body weight gain (kg) of calves of supplemented group II (68.75 kg) was higher than the group I (58.75 kg). The calves of supplemented group II had significantly ($p < 0.05$) higher daily gain 218.17 g/d than non-supplemented group I (205.08 g/d).

Table 59 : Intake and performance of lactating camels under different feeding regimes

Attributes	Group I	Group II	SEM
Dry Matter Intake			
Total DMI/d (30d)	11.40	11.98	0.36
DMI kg/100 kg B.wt	1.71	1.93	0.46
DMI g/ kg ^{0.75*}	95.01 ^a	100.87 ^b	1.89
Performance of Dam			
Initial B. Wt (kg)	606.50	596.25	20.29
Final B. Wt (kg)	591.50	613.00	27.55
Avg. gain /loss (kg)	-15.00	16.75	7.20
Avg. Daily gain (g/d)	-500.00	558.33	240.21

Different superscript capital in rows differ significantly at $P < 0.05^*$

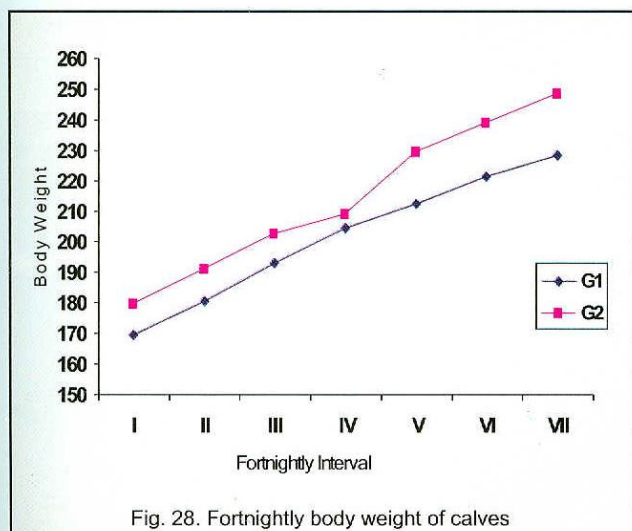


Fig. 28. Fortnightly body weight of calves

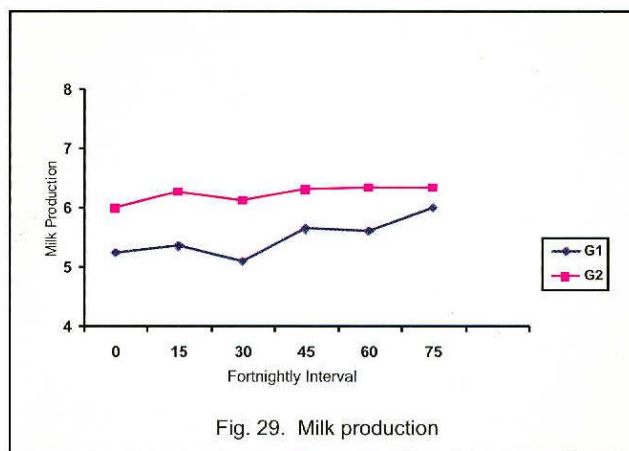


Fig. 29. Milk production

Blood mineral profile revealed significant improvement in phosphorus, Cu and Zn concentration in group II compared to group I. The serum magnesium level did not differ significantly between two groups. The level of Mn was low initially and showed significant ($p < 0.05$) increased due to period and supplement in both groups. Significant improvement in blood urea nitrogen level in comparison to initial values was observed in group I which is due to better availability of nutrients through rangeland as rain occurred in last week of August and continued up to mid September. Likewise, concentration of total protein in both the groups differed significantly ($p < 0.05$) and were higher in group II (6.69 mg %) in comparison to group I (5.95 mg %).

Thus, the overall results of study indicated that feeding of cluster bean straw to lactating camels under traditional system required Ca, P, Cu and Zn supplementation and supplies of nutrients through concentrate and mineral mixture improved the production performance of lactating camels.

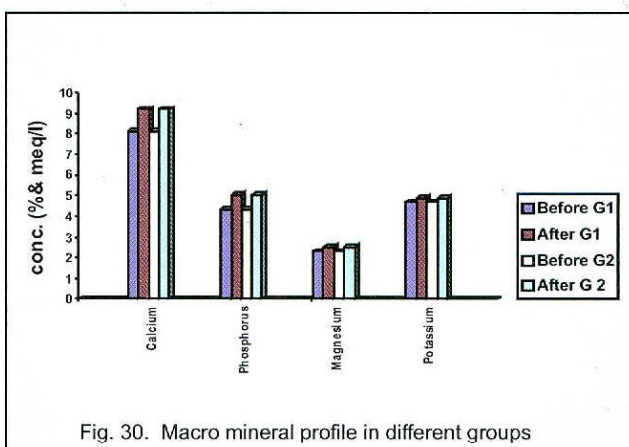


Fig. 30. Macro mineral profile in different groups



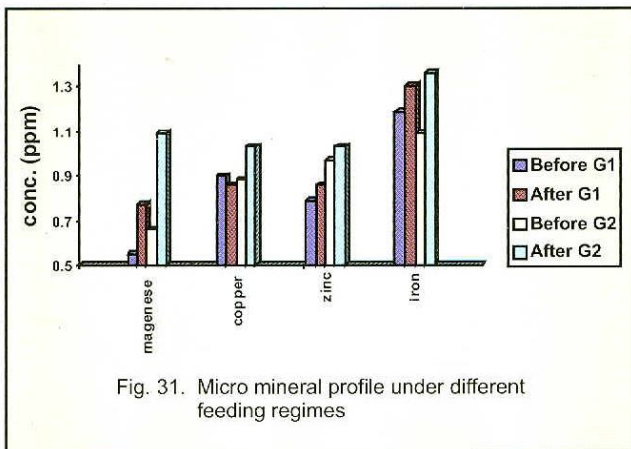


Fig. 31. Micro mineral profile under different feeding regimes

Sub-project: Effect of feeding mineral supplement on reproductive performance of camels

Eight camels without any reproductive problem and genital abnormality with functional ovaries but failed to conceive last years were selected and kept in semi intensive system were fed clusterbean straw *ad lib* and concentrate mixture and formulated mineral mixture @ 50 g/camel/d for 180 days to see the effect of mineral mixture on reproduction performance of camels. Out of eight camels, three camels of Bikaneri breed conceived in first service and first mating instead of average three services given in previous year. Thus, number of service required per conception was lower in comparison to previous year record. Whereas two camels of Jaisalmeri and Kachchhi breed became pregnant after attempt of 4-6 services with three mating in last month of March. Thus, supplementation of concentrate and mineral mixture resulted in six pregnancies out of eight camels.

Serum profile showed significant improvement in Mg, K, Mn and BUN level after supplementation of concentrate and mineral mixture (Table 60). The calcium blood level was significantly ($P < 0.05$) higher (11.32%) in conceived G I group camels than the non conceived (10.40%) G II group camels. Whereas, initial value of phosphorus differed significantly ($P < 0.01$) among the groups and was higher in conceived camels than the non conceived camels. The concentration of Mg increased significantly after supplementation in both group compared to initial values. No significant differences were observed between conceived & non conceived camels. The initial values of Na, K, Cu, Zn, Mn, total protein and urea were more or less similar and showed no significant difference between conceived & non conceived camels. The average values of Fe showed significant difference than initial values due to

supplementation in both groups. The values of total protein were significantly ($P < 0.05$) higher in conceived camels than non conceived camels. While, the blood urea nitrogen level increased significantly in both groups after supplementation of 150 days (Table 61).

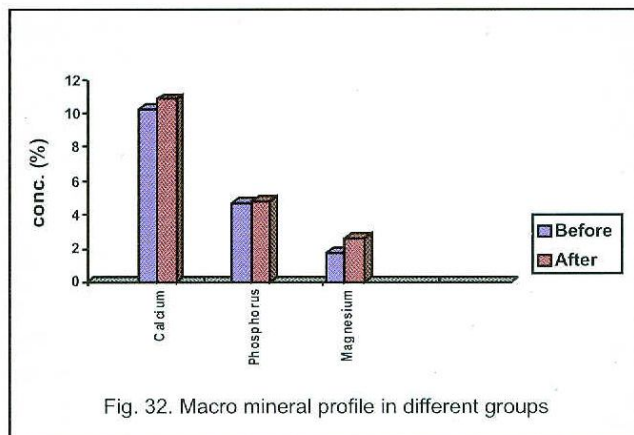


Fig. 32. Macro mineral profile in different groups

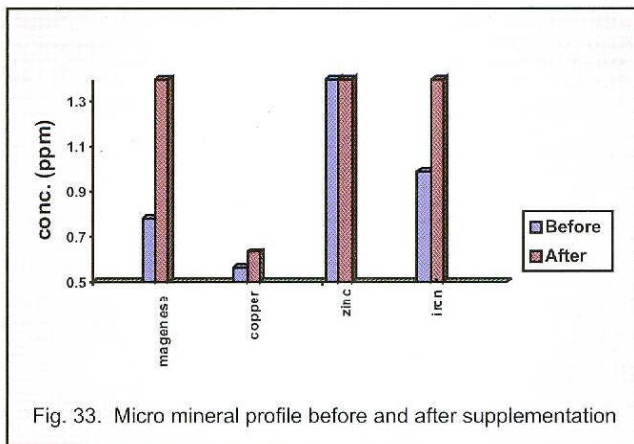


Fig. 33. Micro mineral profile before and after supplementation

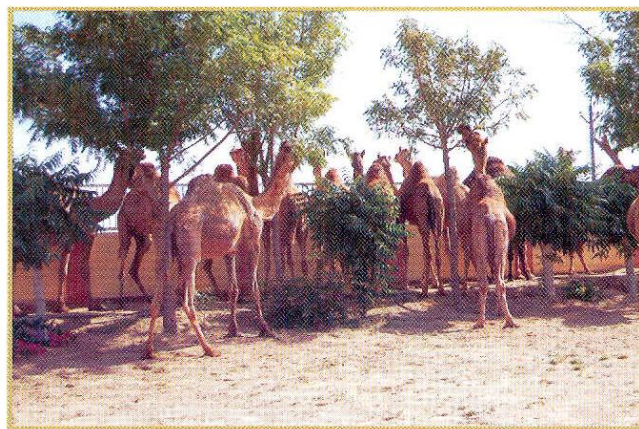


Table 60. Macro mineral picture of conceived vs. non conceived

	%Ca			%P			%Mg		
	G1	G2	SEM	G1	G2	SEM	G1	G2	SEM
Start	10.52	10.46	0.70	4.75 ^A	4.18 ^B	0.07	1.67 ^A	1.81 ^a	0.16
30	12.60	11.60	3.32	7.56	4.39	1.33	2.13	2.27	0.16
60	10.42	11.03	1.36	5.07	5.32	0.39	2.84	2.61	0.14
90	11.03	10.58	0.92	3.50	3.62	0.48	2.97	2.65	0.17
120	11.13	9.92	0.82	3.15	3.82	0.70	-	-	-
150	10.68	9.49	0.28	4.90	4.76	0.35	-	-	-
Avg.	11.32 ^a	10.40 ^b	0.99	4.85	4.38	0.44	2.65 ^B	2.51 ^b	0.08

Different superscript capital /small letter in row /column differ significantly $P < 0.01$ & $P < 0.05$

Table 61. Mineral picture of conceived vs. non conceived

	%TP			%Urea			K(meq/l)			Na(meq/l)		
	G1	G2	SEM	G1	G2	SEM	G1	G2	SEM	G1	G2	SEM
Start	6.17	6.04	0.21	7.96 ^a	7.50 ^A	2.50	3.97	4.5	5.2	139.50	135.00	5.4
30	5.77	5.50	0.33	7.90	10.20	3.01	5.25	5.25	5.0	148.50	152.50	11.0
60	6.57	6.38	0.15	18.08	18.07	1.26	5.08	5.32	6.4	138.37	147.37	9.8
90	5.74	5.50	0.24	10.51	9.74	0.53	5.67	5.68	1.3	149.87	147.37	1.8
120	5.37	5.26	0.44	19.14	14.21	2.92	4.48	4.40	2.9	121.25	126.25	7.6
150	5.96	5.55	0.40	11.33	14.10	1.96	3.85	3.87	3.7	145.50	149.50	9.9
Avg.	5.88 ^a	5.64 ^b	0.07	13.39 ^b	13.26 ^B	0.45	4.82	4.90	2.0	140.70	142.99	1.8

Different superscript capital /small letter in row /column differ significantly $P < 0.01$ & $P < 0.05$

Collaborative Inter institutional Projects

Project: RFLP based genotyping of major histocompatibility complex class II genes in Marwari horses

Project Leader : Dr. R.C.Sharma, NRC on Equines, EPC, Bikaner

Associate : Dr. S.C. Mehta (NRC on Camel), Dr. R.S.Bansal (NRC on Equine)

A total of 22 blood sample of Marwari horses (16 blood samples from field and 6 from EPC) were collected. MHC DRA fragment was successfully amplified and it was of 229 bp. RFLP with *HinfI* resolved 200 bp and 29 bp (not resolved) bands. The unresolved bands can be confirmed by sequencing of the fragment. Digestion with *HaeIII* resolved two bands of 165 bp and 64 bp.

The MHC DQA fragment was successfully amplified (246 bp). The restriction enzymes *MspI*, *NsiI*, *HindIII*, *PvuII* and *HinfI* were utilized for RFLP but no

polymorphism could be detected.

The MHC DRB2 fragment was amplified for 276 bp. *HinfI* digestion revealed polymorphism. The homozygous genotypes were 51.61% with band size of 226 bp and 50 bp. The heterozygous genotypes were 48.39% and the bands were of 276 bp, 226 bp and 50 bp. The restriction enzyme *MspI* digestion resolved all animals to be homozygous with 161 bp plus more than one fragment of remaining part. RFLP with *HaeIII* resolved that all the animals are homogeneous with 220 bp & 56 bp and 160 bp & 116 bp fragments.

Project : Molecular and biochemical studies of acute intermittent porphyria in Indian patients and their families

Project Leader :

Molecular genetics Component : Dr. S.C.Mehta, NRC on Camel, Bikaner

Clinical and Biochemical Component: Dr. D.Kochar, S.P.Medical College, Bikaner



Associates: Dr. S. Kochar, S.P. Medical College, Bikaner

All the available 18 sequences were analysed using Gene Tool. Probable mutations were observed. About 2-3 sequences will be deposited in the GenBank.

Project: Development of a new camelid anti snake venom

Project Leader : Dr. K.M.L. Pathak
(NRC on Camel, Bikaner)

Dr. D. Kochar
(S.P. Medical College, Bikaner)

Associates : Dr. D. Kochar, Dr. S. Kochar,
Dr. P.D. Tanwar
(S.P. Medical College, Bikaner)
Dr. S.K. Ghorui, Dr. G. Nagarajan
(NRC on Camel, Bikaner)

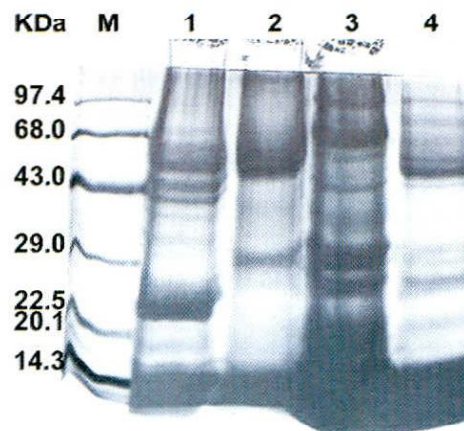
For this project, initially, the snake species of interest (*Echis sochureki*-North Indian Saw Scaled Viper) was caught from the desert areas of Rajasthan and kept in a herpetarium for a few days. Venom was milked out by the experts from the Hoffkin Institute and freeze dried. In addition, for the comparative study, venoms of other poisonous snakes were also procured and their lethal dose were determined by the experts of Hoffkin Institute. The following table shows the LD 50 of the respective venoms of various poisonous snakes from India.

Table 62 : LD 50 of venoms of various poisonous snakes

Snake	LD 50
Krait (<i>Bangarus caeruleus</i>)	1.5-3 mcg
Cobra (<i>Naja naja</i>)	8-10 mcg
Russell's viper (<i>Daboia russellii</i>)	7-12 mcg
Saw scaled viper (<i>Echis carinatus</i>)	10-15 mcg
Saw scaled viper (<i>Echis sochureki</i>)	8-10 mcg

The protein profile of various venoms was also analysed by running SDS-PAGE (10% gel). In the gel, there was a great difference in the number and intensity of various protein bands among the protein profiles of various snakes (Fig. 34) However, further study is under

Figure 34 : SDS-PAGE Analysis of Snake Venoms



M - Protein molecular weight marker

1 - *Echis sochureki*

2 - *Echis carinatus*

3. *Daboia russellii*

4. *Naja naja*

progress to characterize the unique protein bands of the venom from the snake species of interest, which cause the pathognomonic signs in human and other victims.

Project: Development of single domain antibodies for diagnosis and therapy

Project Leaders: Dr. K.M.L. Pathak
(NRC on Camel, Bikaner)

: Dr. V. Venugopal
(Bhabha Atomic research centre,
Mumbai)

Associate : Dr. S. K. Ghorui, G. Nagarajan
(NRC on Camel, Bikaner)

During the period under report two antigens - Tb38 and Thyroglobulin (Tg) were initiated in two camel each to develop SDA in camel. After 6th booster camel immunized with Tg were assayed for level of antibody production through Radio immuno assay at BARC, Mumbai. The level of binding at different dilution of serum is shown in table 63. However, out of two camel, one camel showed better response while using same dosage of antigen. This reflected the individual variability to response of antigen. The study is under progress.



Table 63 : The level of binding at different dilution of camel serum

Antibody Dilutio	Camel 1% B/T	Camel 2% B/T
1:100	10.9	21.7
1:200	7.5	17.2
1:400	6.7	13.5
1:800	5.2	9.4
1:1600	4.4	6.9
1:3200	3.3	4.4
1:6400	2.8	4.1
1:12800	3.1	3.0
1:25600	2.7	2.9
1:51200	2.8	2.8
1:102400	2.5	2.7
1:204800	2.6	2.9

Project: Development of a cell culture adapted live attenuated camel pox vaccine

Project Leader : Dr. R.K. Singh
(Indian Veterinary Research Institute, Mukteshwar)

Associates : Dr. V. Bhanuprakash
(Indian Veterinary Research Institute, Mukteshwar)

Dr. K. M. L. Pathak
(NRC on Camel, Bikaner)

For this project, initially, four male camel calves of less than one year of age were selected and kept in an isolated area (not in the vicinity of other camles). Venous blood was collected, sera separated and analysed for the presence of natural antibodies against camelpox virus, if any. Preimmunization sera samples were

collected from all the four camles. Animal No. 1 & 2 were given 0.2 ml & 0.5 ml of the cell culture adapted camelpox vaccine of 45th passage respectively whereas Animal No. 3 & 4 were given 0.2 ml & 0.5 ml of the cell culture adapted camelpox vaccine of 50th passage respectively. All the four camles were vaccinated by intradermal route at the abaxial surface of the tail. Sera and Plasma samples from all the four camles were collected on days 7, 14, 21 and 28 post vaccination. Rectal temperature of all the four camles was recorded two times a day upto first five days post vaccination and once in a day upto 14 days.

All the four camles were under observation for the period of three months post vaccination in the isolated area. Sera samples will be assessed for the humoral response of the animals to vaccine by serum neutralization test.

Agriculture Farm**To enhance fodder resources to support camel feeding****Work undertaken****Sowing- April to September 2007**

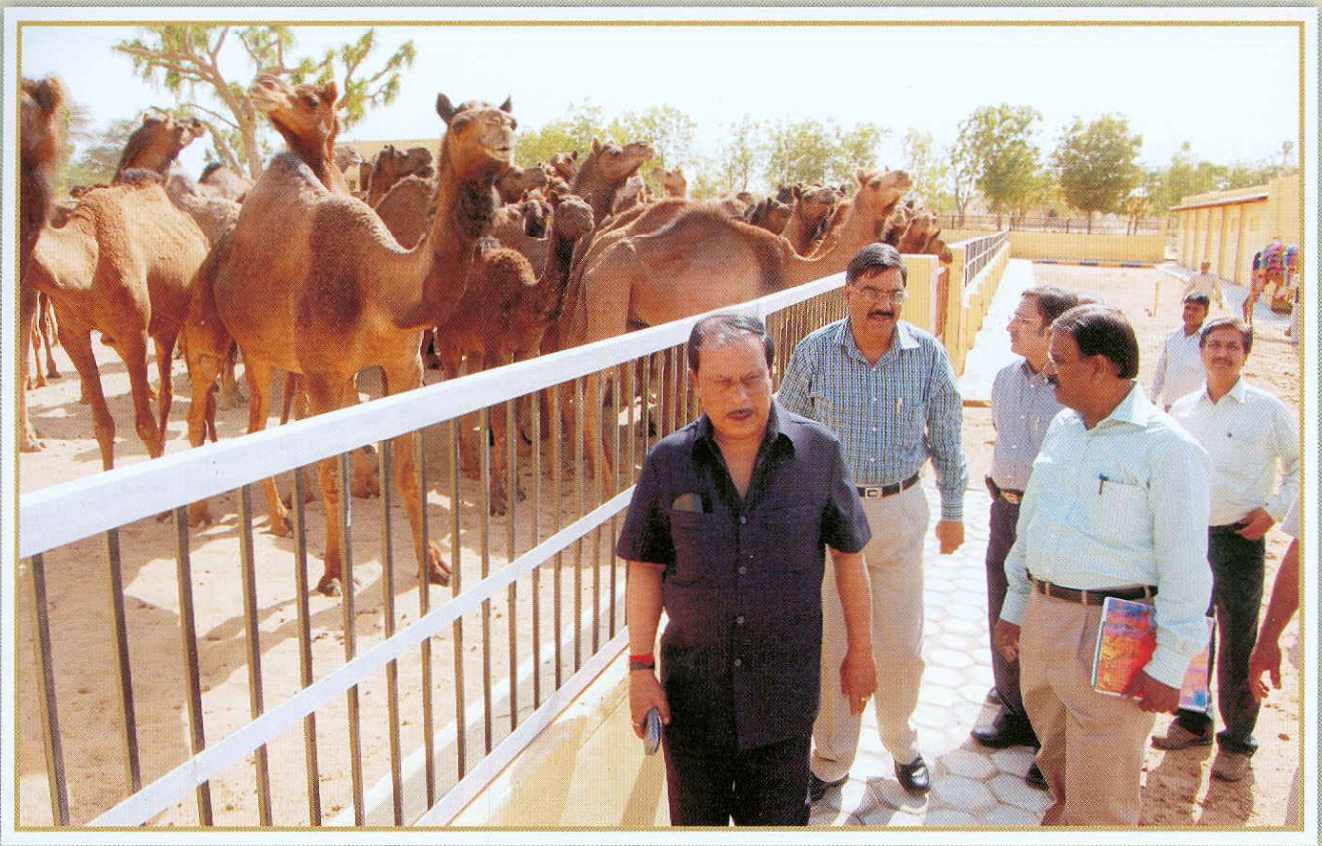
- Sewan (*Lacurus indicus*) 3 hectares
- Phog (*Colligonum polygonoides*) - 2 hectares
- Guar (*Cyamopsis tetragonoloba*) - 7 hectares
- Plantation of tree saplings - 2300

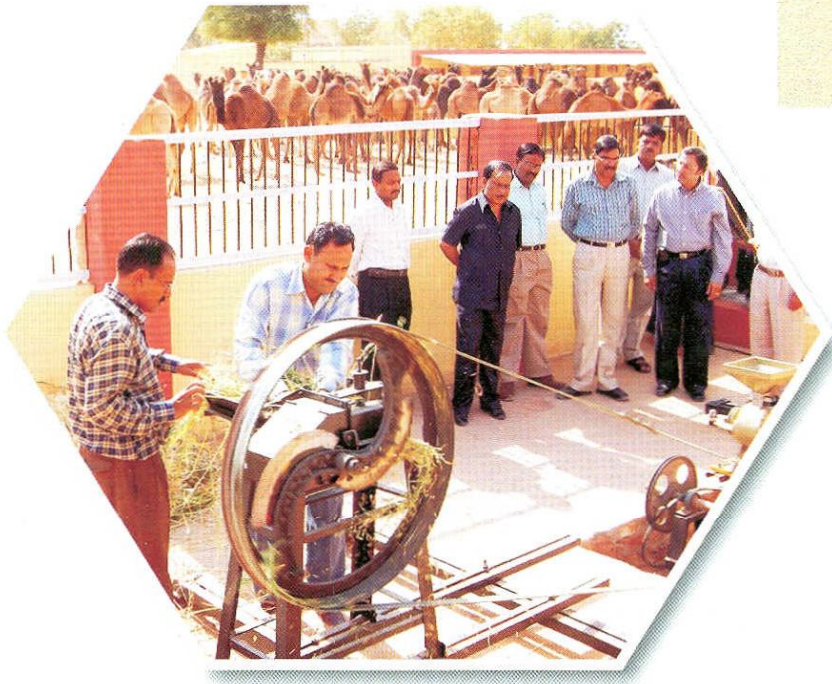
Sowing October 07 to March 08

- Oat- 3.5 hectares, transplantation of phog, sewan tree seedlings.

Monitoring of rainfed contract crops of guar, moth and tubewell commissioning as well as other assigned work of the unit and security of the farm area.







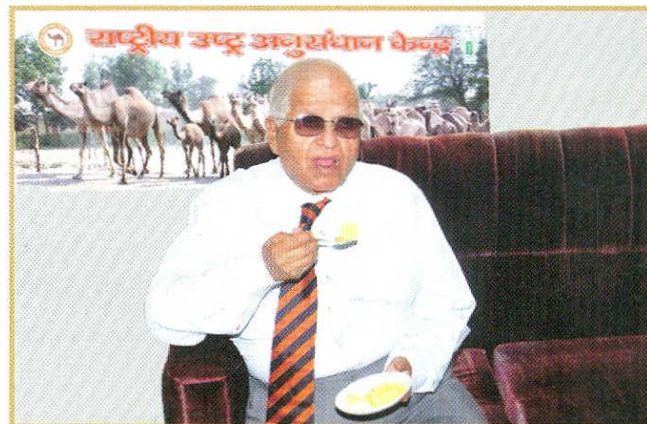
Technology Assessed and Transferred

a) Camel milk products

The Centre has developed technology to produce camel milk products viz. flavored milk, kulfee, tea and coffee. The technology is easy and camel farmers of Pali and Jaisalmer district were imparted training in collaboration with NGO (Lokhit Pashupalak Samiti, Sadri).

At present camel is being reared mostly for draft purpose. In the changed social scenario the use of camel as means of transportation and agricultural operation is on decline. The production of camel milk and its value added products will help to improve the economic viability of camel rearing

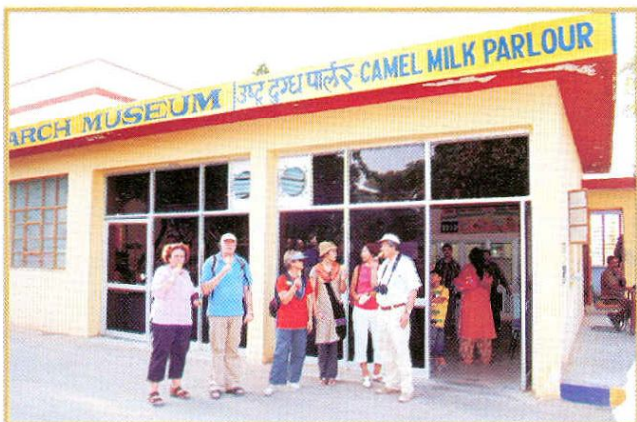
At present camel farmers in general are not rearing camels for milk production. Therefore if the technology of camel milk and its products is implemented at the field level, the camel farmers will get additional revenue by selling camel milk or its value



added products. This extra income may also attract other farmers towards camel husbandry.

The Centre has already taken step to transfer the technology related to camel milk products to the field level with involvement of NGOs and Rajasthan Cooperative Dairy Federation (Urmul Dairy, Bikaner).





Early post parturient breeding

The research at the centre has revealed that it is possible to breed the female camels during early post parturient period and successful conception was achieved in 20-25 percent of the parturient females. This is an unorthodox way of breeding resulting in significant

reduction in inter-calving period.

The long gestation period (390 days approximately) coupled with seasonality of breeding (December-March) makes camel reproduction less attractive economically. Traditionally the female camels are bred in one season, calve in subsequent breeding season and then remain sexually quiescent until the following breeding season, leading to long inter-calving period and significant economic losses.

The breeding at 30, 50 or 70 days after parturition have resulted in 20-25 percent conception, thus reducing the inter-calving period by at least 300 days.

The adoption of this practice can yield 20 percent more calves from the present adult breedable female camels. This technology or breeding practice does not involve extra cost or managerial inputs. Therefore efforts will be made to spread it to the farmers with the help of NGOs.





Education and Training, Awards

Sports

1. Shri Mohan Singh T-5 was adjudged first in Discuss throw and third in Shotput at ICAR Inter- Zonal (National level) sports meet organized during 20-24 November, 2007 at IARI, New Delhi.
2. Shri Mohan Singh T-5 stood first in Discuss throw and Shot put at ICAR Inter-Institutional sports meet (Western Zone) organized during March 4-8, 2008 at CAZRI, Jodhpur.

One month training programme

NRC on Camel regularly organized one- month training programme for graduate students of various discipline viz B.Sc. (Bio-technology), B.E. (Engineering) B.Sc. (Microbiology) and similar fields. During this period, eight students were exposed to various technologies used for research in camel genetics and breeding, camel health, camel physiology and

reproduction. They are also exposed to use of computer and library as an aid to research programme.

Two months training programme

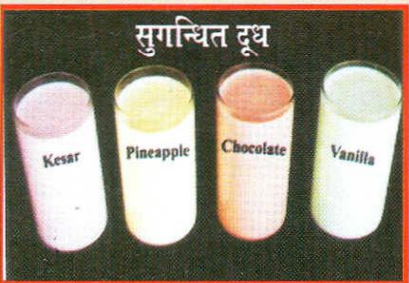
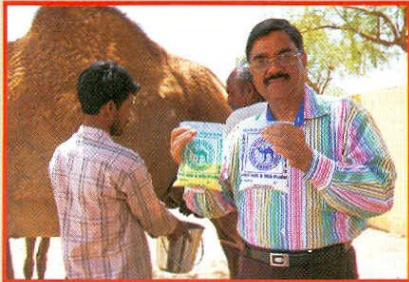
NRC on Camel also organized two months training program for dissertation to post graduate students of Biotechnology. This year 10 students completed their dissertation.

Ph.D. research work

Three Ph.D. students of Bikaner University are doing their research work under supervision of scientists (co-advisor) of the centre. One Ph.D. student from College of Veterinary & Animal Science, Rajasthan Agricultural University, Bikaner is doing research work in Veterinary Medicine at our centre. The laboratory facility of the centre was provided to seven other students for minor analytical work of their research work.



रेत पर दूध का झरना





Linkages and Collaborations

National

Collaborative University/Institute	Programme
Rajasthan Agricultural University, Bikaner	Research work of M.V.Sc. and Ph.D. students
Bikaner University, Bikaner	Research work of Ph.D. students
Maharana Pratap University of Agriculture and Technology, Udaipur	Camel drawn implements and electrical generation Development of anti-snake venom.
Sardar Patel Medical College, Bikaner	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







List of Publications

Research Paper Published

1. Aminu Deen (2008): Testosterone profiles and their correlation with sexual libido in male camels. *Research in Veterinary Science* (In press). Published online.
2. Aminu Deen (2007): Unique sperm depot in camel semen. *Biochemistry-An Indian Journal*, 1(3): 149-150.
3. Aminu Deen (2007): Low ambient temperature with the onset of winter can disturb Radioimmunoassay due to increased association constant of antibody. *Analytical chemistry-An Indian journal*, 6 (2): 92-95.
4. Bhakat Champak and Sahani M S (2007): Health hazards of camel in irrigated and non irrigated zones of Thar desert. *Indian Veterinary Journal* 84 (12): 1332-1333.
5. D. Suchitra Sena, G. Mal, M. S. Sahani and A. Bhati (2007): Comparative studies on micro-mineral profile in camels. *Indian Veterinary Journal* 84: 698-700.
6. Dixit, S.K., Tuteja, F.C., Singh, A.P. and Sena, D.S. (2007): Evaluation of plants/herbs for antimicrobial activity. *Veterinary Practitioner* 8(1): 14-19.
7. Dixit, S.K., Tuteja, F.C., Singh, A.P. and Sena, D.S. (2007): Evaluation of plants/ herbs for immunomodulatory property. *Veterinary Practitioner* 8(1): 37-40.
8. Gorakh Mal and D. Suchitra Sena (2007): Milk composition among different breeds of camel. *Indian Veterinary Journal* 84: 1064-65.
9. Mehta, S.C. and Sahani, M.S. (2007). Microsatellite markers for genetic characterisation of Bikaneri camel. *Indian Journal of Animal Sciences*. 77(6): 509-512.



10. Mehta, S.C. and Sahani, M.S. (2007). Microsatellite analysis in Jaisalmeri camel (*Camelus dromedarius*). *The Indian Journal of Animal Genetics and Breeding*. 27(1,2): 22-26.
11. Mehta, S.C., Goyal, A. and Sahani, M.S. (2007). Microsatellite markers for genetic characterisation of Kachchhi camel. *Indian J. Biotechnology*. 6 : 336-339.
12. Nagpal, A.K. (2007). Nutrient utilisation and performance of pregnant camels kept on different levels of protein. *Journal of Camel Practice and Research*. 14 (1):79-82.
13. Sodhi, M., Mukesh, M, Ahlawat, S.P.S., Sobti, R.C., Gahlot, G.C., Mehta, S.C., Prakash, B. and Mishra, B.P. (2008). Genetic diversity and structure of two prominent zebu cattle breeds adapted to the arid region of India inferred from microsatellite polymorphism. *Biochemical Genetics*. DOI 10.1007/s10528-007-9135-5.
14. Vyas, S., Singh, R., Purohit, G.N., Pareel, P.K., Sahani, M.S. (2008): Ultrasound evaluation of ovarian response to photoperiodic control measures in *Camelus dromedarius*. *Veterinarski Arhiv* 78(1): 39-48.
8. रॉय ए.के. एवं पाठक के.एम.एल. (2007) : मैं ऊँट हूँ, राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर (राजस्थान).
9. रॉय ए.के. एवं पाठक के.एम.एल. (2007) : उष्ट्र कल्याण एवं प्रबन्धन, करम (अंक 5), 9-11.
10. रॉय ए.के. (2007) : आधुनिक परिवेश में उष्ट्र पालन करम (अंक 5), 57-58.
11. रॉय ए.के. (2007) : बेचारा ऊँट और एक सवाल, करम (अंक 5) : 65.
12. टुटेजा एफ.सी. एवं दीक्षित एस.के. (2007) : उष्ट्र उपयोगिता : नये आयाम, करम (अंक 5), 27-29.
13. व्यास सुमन्त (2007) : किसपेप्टिन-वय : संधि का मुख्य कारक, करम (अंक 5), 30-32.
14. नागपाल ए.के. एवम् अश्विनी कुमार रॉय 2007: जल अभाव : जीवन, कृषि, अर्थव्यवस्था संकट करम 5 38-40 राष्ट्रीय उष्ट्र अनुसंधान केन्द्र बीकानेर.
15. नागपाल ए.के. 2007 : स्वच्छ पानी पीजिए - निरोग व तन्दुरुस्त रहिए - करम (5) 79-81 राष्ट्रीय उष्ट्र अनुसंधान केन्द्र बीकानेर.
16. अश्विनी कुमार रॉय एवम् नागपाल ए.के. 2007: रेगिस्तानी परिदृश्य एवं उष्ट्र उपयोगिता करम (5) 66.69 राष्ट्रीय उष्ट्र अनुसंधान केन्द्र बीकानेर.

Booklets, Technical / Popular Articles:

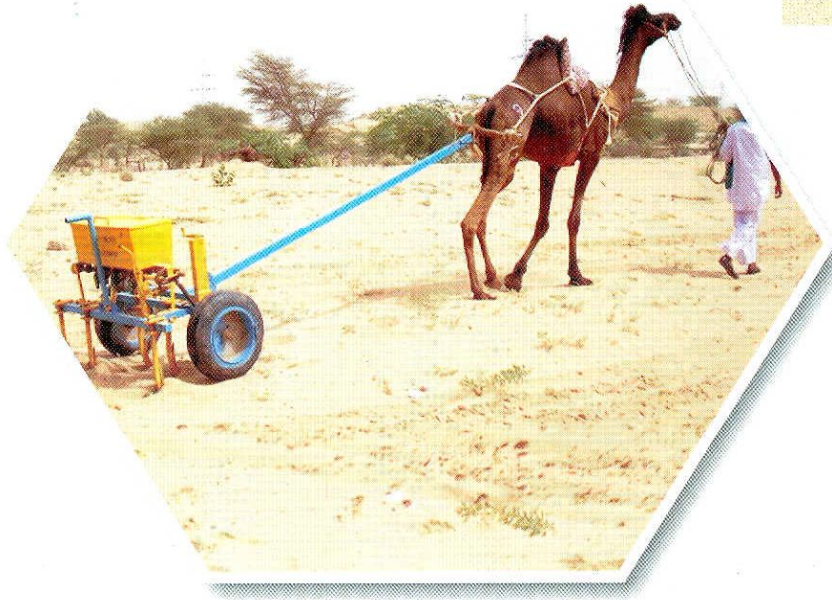
1. Aminu Deen (2007): News on the developments made for Artificial Insemination in camels. VCI Newsletter Vol. II (3) July to September 2007.
2. अमीनुद्दीन 2007 : ऊँटों के प्रजनन में उपयोगी हार्मोन : कृषि चयनिका 28 (3) : 17-19.
3. भक्त चम्पक एवं पाठक के.एम.एल. (2007) : थार रेगिस्तान में ऊँट की उपयोगिता अधिक प्रभावशाली : एक तुलनात्मक अध्ययन, करम (अंक 5), 12-15.
4. दीक्षित एस.के., टुटेजा एफ.सी. एवं सेना जी.एस. (2007) : ग्वारपाठा : मरुस्थल का औषधीय पादप - करम (अंक 5), 33-35.
5. गोरखमल, जी. सुचित्रा सेना एवं नन्द किशोर (2007) : ऊँटनी के दूध से मक्खन और घी बनाने की विधियाँ, करम (अंक 5), 16-18.
6. मेहता एस.सी. एवं भूरे एस. के. (2007) : दूध प्रोटीन जीन्स एवं उनका परिलक्षण, करम (अंक 5), 22-24.
7. मुंजाल दिनेश (2007) : कम्प्यूटर नेटवर्किंग का महत्व, करम (अंक 5), 45-47.
1. Aminu Deen (2008): Artificial insemination in camel is not successful. (Editor; Gahlot, T.K.) Proceeding of the International Camel Conference on recent trends in camelids research and future strategies for saving camels, College of Veterinary and Animal Science, Bikaner, Rajasthan held on 16-17 February 2007, pp 97-102.
2. Aminu Deen and Nand Kishore (2008): Estradiol hormone profiles in unmated female camels during breeding season. (Editor; Gahlot, T.K.) Proceeding of the International Camel Conference on recent trends in camelids research and future strategies for saving camels, College of Veterinary and Animal Science, Bikaner, Rajasthan held on 16-17 February 2007, pp 103-106.
3. A K Roy (2008): Effect of biochemical, hormonal and behavioral factors at the beginning of puberty in young male camels; *Proceedings of the International Camel Conference (16th to 17th Feb.*



- 2007) : 89-90. *College of Veterinary and Animal Science(Rajasthan Agriculture university) Bikaner, Rajasthan.*
4. A.K. Nagpal, A K Roy and R.C. Jakhmola (2008): Production potential of Pala (*Zizyphus nummularia*) leaves for rutting camels; *Proceedings of the International Camel Conference (16th to 17th Feb. 2007): 151-152. College of Veterinary and Animal Science (Rajasthan Agriculture University) Bikaner, Rajasthan.*
 5. Nagpal, A.K., Singh, G.P., Saini. N. and Jayant, P. (2008): Voluntary feed intake, serum profile, growth performance and economics of weaned camel calves. *Proceedings of the International Camel Conference.16-17 February, 2007 held at college of Veterinary and Animal Science, RAU, Bikaner. (editor T.K.Gahlot) pp.153-155.*
 6. Gorakhmal and K.M.L.Pathak (2008). Camel milk : A neutraceutical health drink. In 4th Neutraceutical summit poster session on Nu fundas in Health and food expo, Mumbai, 21-23, 2008.
 7. Nagpal, A.K. (2007): Comparative performance of dry and lactating camels under arid ecosystem of Rajasthan. *International Animal Nutrition Conference TROPNUTRICON-2007 held on October 4-7, 2007 at NDRI, Karnal p.321.*
 8. Nagpal, A.K. (2007): Voluntary feed intake, milk production and body weight changes of lactating camels. *International Animal Nutrition Conference TROPNUTRICON-2007 held on October 4-7, 2007 at NDRI, Karnal p.321-322.*
 9. Ghorui SK, Nagarajan G and Pathak K M L (2007) PCR amplification of OligopeptidaseB opdB) gene in *Trypanosoma evansi* isolates from camel. *Proceeding of XVIII National Congress of Veterinary Parasitology, Sept.7-9, 2007, Jammu.*







List of Ongoing Research Projects

Research Projects

Camel Genetics & Breeding

- ❖ Studies on qualitative and quantitative genetic parameters in Indian Camel
- ❖ Molecular genetic studies in Indian camel
- ❖ Selection for the improvement of draughtability of camel breeds
- ❖ Genetic improvement of milk production potential of Indian dromedary
- ❖ RFLP- based genotyping of major histocompatibility complex class II genes in Marwari horses
- ❖ Molecular and biochemical studies of acute intermittent porphyria in Indian patients and their families

Camel Physiology

- ❖ Haematological, biochemical, enzymatic and hormonal profiles of camels

- ❖ Efficient utilization of camel energy during cart pulling and agricultural operations by camels
- ❖ Development and Assessment of Camel Milk Products
- ❖ Evaluation of the developed camel milk skin cream for anti-wrinkling properties
- ❖ Evaluation of camel milk proteins and their application

Camel Reproduction

- ❖ Improving reproductive efficiency and to study the causes of reproductive failures in camel
- ❖ Isolation and characterisation of the major gel proteins in camel semen
- ❖ Studies on reduction of inter-calving period in camel

Camel Health

- ❖ Epidemiology of infections camel diseases



- ❖ Development of a new camelid anti snake venom
- ❖ Evaluation and validation of ethno-veterinary practices against camel diseases
- ❖ Epidemiology of deficiency/ Toxic and metabolic diseases in dromedary camel
- ❖ Therapeutic spectrum of selected herbs against dermatophytes / bacteria
- ❖ Molecular Cloning and Characterization of Cameline Cytokine Gene(s)
- ❖ Generation and validation of suitable formulation for treatment of mastitis
- ❖ Investigations on digestion fermentation disorder with particular reference to indigestion and impaction
- ❖ Development of a cell culture adapted live attenuated camel pox vaccine
- ❖ Development of single domain antibodies for diagnosis and therapy

- ❖ Immunity status in neonatal calves under three different management practices

Camel Nutrition

- ❖ Studies on nutrient requirement and feed resource availability in camel for optimum production
- ❖ Development and testing of complete feed block for male breeding camel
- ❖ Studies on digestive fermentation pattern in locally available camel feed and fodder
- ❖ AICRP on "Improvement of Feed Resources and Nutrient Utilization in Raising Animal Production"

Camel Management

- ❖ To study the economics of different camel management practices under arid and semi- arid eco-system





QRT, IMC, RAC, Management Committee and IRC

Management Committee, Research Advisory Committee and Institute Research Committee Meeting

Institute Management Committee

The Director of the Centre, who is in-charge of the overall management of the institute, is assisted in the discharge of his functions by the management committee of the institute (constituted by the Council) by providing a board based platform for decision making process by periodically examining the progress of the Centre activities and by recommending suitable remedial measures for bottlenecks. The present IMC of the Centre comprises of:

Prof. K.M.L Pathak Director N.R.C on camel, Bikaner	: Chairman
Dr. C. S. Prasad Assistant Director General (AN&P) ICAR, New Delhi	: Member
Prof. A. K. Gehlot	: Member

Dean, College of Veterinary & Animal Science, RAU, Bikaner

Sh. Shree Gopal Upadhyay : Member
Ex- Sarpanch, Kolasar Gram Panchayat, Shree Sadan, In side Idgah Bari, Dharm Nagar, Bikaner- 334005

Sh. Mahendra Kumar Jhajharia : Member
Post- Keharpura Kalan, Tehsil Chirawa Dist. Jhunjhunu, Rajasthan

Sh. K. P. Sharma : Member
Assistant Administrative Officer Secretary
N. R.C. on Camel, Bikaner

The meeting of IMC for the year 2007-08 was held on 25.6.2007 under the chairmanship of Prof. K.M.L. Pathak, the other members including Dr C.S. Prasad, ADG (AN&P), Dr A.K. Gahlot, Dean, CVAS, Bikaner, Dr S.K. Kaushish, PS, CAZRI, Dr Aminudeen,



PS, NRCC, Dr J.S. Patil, Assistant Director, AH, Gandhinagar, Gujarat, Shri Shree Gopal Upadhyaya, Shr O.P. Nagar, F&AO, CSWRI, Avikanagar, Dr Rajan Gupta, Senior Scientist, Animal Science Division, ICAR, new Delhi and Shri K.P. Sharma, AAO, NRCC attended the meeting. The chairman explained XI five year plan proposals and also briefed the members about achievements of the centre and ongoing activities. He expressed that all possible efforts would be made by the centre for achieving the targets as per the mandate. The



chairman specially thanked the new ADG Dr C.S. Prasad for cooperation and interest in the centre. The minutes of the previous meeting of IMC held on 23.2.2006 were confirmed and new agenda items including new civil works, spill over works and new priority equipments were approved.

Research Advisory Committee (RAC)

The compositions of the RAC (upto 9.5.2008) is as follows :

- | | |
|---|------------|
| Prof. Nagendra Sharma
Vice- Chancellor, Sher-e- Kashmir
Univ. of Agr. Tech. , Jammu (J&K) | : Chairman |
| Dr. N. D. Khanna
Ex- Director NRC on Camel
Flat No. 901, Sector 9,
Multi Storey Building, Malviya Nagar,
Jaipur- 302017 | : Member |
| Dr. B. C. Patnayak
Ex- Director, CSWRI,
S-30, Maitri Vihar (Phase-I)
Chandrasekharpur, Bhubaneswar-751023 | : Member |

- | | |
|--|-----------------------|
| Dr. J. S. Bhatia
Ex- ADG, ICAR
Apollo College of Veterinary Medicine
Agra Road, Jaipur | : Member |
| Prof. A. K. Gehlot
Dean, College of Veterinary &
Animal Science, RAU, Bikaner | : Member |
| Sh. Shree Gopal Upadhyay
Ex- Sarpanch, Kolasar Gram
Panchayat, Shree Sadan,
In side Idgah Bari,
Dharm Nagar, Bikaner- 334005 | : Member |
| Sh. Mahendra Kumar Jhajharia
Post- Keharpura Kalan,
Tehsil Chirawa
Dist. Jhunjhunu, Rajasthan | : Member |
| Prof. K.M.L. Pathak
Director,
NRC on Camel, Bikaner | : Member |
| Dr. Aminu Deen
Principal Scientist,
NRC on Camel, Bikaner | : Member
Secretary |

The meeting of the RAC of NRCC, Bikaner was held in the committee Room of NRCC, Bikaner on December 7, 2007 at 10.30 AM. Dr. Nagendra Sharma, Chairman, Dr. K.M.L. Pathak, Member, Dr. N.D. Khanna, Member, Dr. B.C. Patnayak, Dr. B.C. Patnayak, Dr. J.S. Bhatia, Member, Dr. A.K. Gahlot, Member, Sh. ShreeGopal Upadhyay, Member, Sh. Mahendra Kumar Jhajharia, Member, Dr. Aminu Deen, Member Secretary were present in the meeting. . Dr. C.S. Prasad, ADG (AN&P), ICAR could not attend meeting due to some urgent official work with respect to Annual Plan and XIth EFC document finalization at Headquarters. Before the



start of meeting, the Chairman and members were taken to various units, research laboratories and other locations and the activities were shown to them.

Prof. K.M.L. Pathak, Director, NRC on Camel, Bikaner extended a warm welcome to Chairman and other members of the RAC including two new members namely Sh. ShreeGopal Upadhyay and Sh. M.K. Jhajharia and also briefed about salient activities of various research programmes in operation during 2006-07 at Centre. He presented a road plan of new and important research targets in areas like exploring the potential of milk production in camel and camel milk as a health drink, exploration of camel immune system and its applicability in the diagnosis of certain human diseases, camel as a source of power, improved camel management practices under changing climatic scenario to be taken up during XIth Plan. The new look of the center with the upgrading of infrastructural facilities including reorganization of research laboratories, renovation of campus and guest house, land scaping and improvisation in camel museum, camel milk parlor were highlighted. The house was further appraised about strengthening of inter-institutional linkages namely signing of MoU with Bhabha Atomic Research Centre, Trombay, S.P. Medical College, Bikaner, Bikaner University, Bikaner and proposing Distance Education Course on Sustainable Camel Farming with RAU, Bikaner.

Dr. Nagendra Sharma, Chairman responded to the welcome and expressed appreciation for efforts being made by the scientists and staff of NRCC under the able leadership of Prof. K.M.L. Pathak. He hoped that the pace of research and extension endeavours, inter-institutional linkages and infrastructural development would maintain the initial momentum owing to the inbuilt positive vision in the leadership of Prof. Pathak and working atmosphere in the Centre.

It was resolved to confirm the proceeding of RAC meeting held on 24-25 June, 2006. The report of research projects completed during 2006-07 was presented by the Member Secretary and after indepth discussion it was resolved to approve the report with the certain gaps in the achievements of objectives to be completed, particularly on research programmes on physiology, biochemistry and nutrition. There should be proper documentation and compilation of information

generated through these projects and it should be documented in the form of publications. It was resolved to approve the research programme for XI Plan finalised at SMD level in ICAR.

It was also resolved that looking to the research activities; the present available scientific strength is not enough worth for carrying out the mandate. The Centre be provided additional scientific man power in the discipline of Animal Genetics & Breeding, Pathology, LPM, Microbiology and Veterinary extension. Dr. N. D. Khanna emphasised that work should be initiated on studies of Immuno-globuline and immune system in camels both at molecular level and serological level. The RAC also emphasized that work should be started on double humped camels. The Chairman agreed to request Vice Chancellor of Sher-e-Kashmir Agricultural University, Srinagar to provide necessary help in this matter. The RAC further recommended that the decision of Planning Commission in IX Plan approval for converting NRCC to full fledged Institute with adequate Scientific and technical manpower may be implemented in XI Plan.

Institute Research Committee (IRC)

The Institute Research Committee (IRC) formerly known as Staff Research Council (SRC) of the Centre is an important forum to guide the scientists in the formulation of new research projects and review the progress of ongoing research projects periodically. Annual IRC meeting for the year 2007-08 was held on 9th May, 2008 under the Chairmanship of Prof. K.M.L. Pathak, Director, Experts of the various subjects form different Institute, Universities and ICAR, Dr. C. S. Prasad, ADG (AN&P), ICAR, Krishi Bhawan, New Delhi, Dr. S. B. S. Yadav, Director Research (VAS), RAU, Bikaner, Dr. R. C. Jakhmola, Head, CSWRI Regional Station, Bikaner, Dr. R. S. Khatri, PS, IASRI, New Delhi, Dr. M. B. Chabra, Prof & Head(Retd.) New Delhi, Dr. G. Prasad, Prof, Animal Biotechnology, CCSHAU, Hisar, Dr. D. Swaroop, PS & Head IVRI, Izatnagar, Dr. S. K. Agarwal, PS, IVRI, Izatnagar, Dr. (Mrs) Meekashi, Associate Professor animal Biotechnology, CCSHAU, Hisar participated. Important recommendations were made after the presentation of each project. Progress of the on going research projects were discussed and new projects were approved.







Participation in Conferences, Meetings, Workshops, Symposia and Trainings

Training

1. Dr Sumant Vyas Sr. Scientist, was deputed for post-Doctoral Fellowship at INRA France (September, 2006- August, 2007) in the project Pheroestrus (Pheromones of estrus) at UMR Physiologie de la Reproduction et des Comportements (PRC), l'Institut National de la Recherche Agronomique (INRA) centre de Tours, Nouzilly, 37380, France. The objective of the project was to fully characterise the pheromones used by farm mammals to detect females in oestrus. He worked in the team (led by Dr Philippe Chemineau) working on behaviour component (bovine) of the project. The sexual behaviour of bulls towards estrus, diestrus cow and steers was also studied. The behavioural response of the bull towards various liquids (olfactory signal) in

the absence of cows or steers was examined in different experimental models. The results revealed that bulls could differentiate the three types of urine samples (estrus, diestrus and bull urine) from scented and unscented colored physiological saline. The flehmen and other behavioral responses of bull were not significantly different in case of three types of urine samples (estrus, diestrus and bull urine). This suggested that urine is not the only source of phero-chemical signal of estrus to the bulls. It may be possible that the bulls do not differentiate between estrus and diestrus urine in absence of cow or other secretions. These preliminary results also suggested that olfactory system alone may not be capable of detecting estrus. Estrus detection by the bulls probably requires joint involvement of olfactory, visual and acoustic responses.



2. Dr AK Nagpal, Senior Scientist, participated in International Animal Nutrition Conference TROPNUTRICON-2007 held on October 4-7, 2007 at NDRI, Karnal (Haryana).
3. Dr. S. K. Ghorui, Senior Scientist, participated in XVIII National Congress of Veterinary Parasitology held during September, 7-9, 2007 at SKUAT, Jammu.
4. Dr. Gorakhmal Senior Scientist participated in National Symposium : Nanotechnology in biomedical sciences and molecular diagnostics at IVRI, Izatnagar during December, 22-23, 2007.
5. Dr. Gorakhmal, Senior Scientist participated in 4th Neutraceutical summit on Nu fundas in Health and food expo at World Trade Centre, Mumbai during February 21-23, 2008





Workshop, Seminar, Summer Institute and Brain Storming Meet Organized, Visitor, Joining, Transfer and Retirements

Brain storming session

One day Brain storming meeting on "Prioritize major researchable issues related to management of camel disease and impending climate change scenario"

In order to get feed back from the field, reasonable persons from the Animal Husbandry Dept., Govt. Rajasthan and to make the ideas rational with the view of different health subject matter specialists involved in cameline disease investigation, directly or indirectly a One day Brain storming meeting on "Prioritize major researchable issues related to management of camel disease and impending climate change scenario" was organized on 12th, March 2008. The subject matter specialist from ICAR institutes (IVRI, CSWRI), RAU, Bikaner, CCSHAU, Hissar, SKAU, Dantiwada, senior veterinary officers from Animal Husbandry Department, Govt. Rajasthan, camel owners, extension workers participated in the meet with full zeal and interest.

After the welcome address by Dr. S. K. Ghorui, organizing secretary, Prof. K. M. L. Pathak, Director, NRCC, and Chairman of the meeting further explained the purpose of the meet and also welcomed the house with illuminating ideas and guidance.

Dr. S.K.Ghorui presented very brief illustrations of the achievements made on different cameline disease parasitic bacterial, fungal and future programs to be taken up on this SWOT analysis.

Dr R.K. Singh, Principal Scientist and Head, Division of Virology, IVRI, Mukteswar, presented some important viral diseases of camel including camel pox and expressed his desire for further collaboration in this regard.

Many ideas, views, questions and their almost all possible explanations were derived through one to one discussion, in a healthy way. The notable ideas were as follows,

- 1) Development of some diagnostic kit for important camel diseases and their wide scale validation



- 2) Epidemiology and surveillance of the cameline diseases should be on proper record.
- 3) Nutritional diseases of camel should also be studied. The interaction between Camel diseases and micro/macro nutrients should be studied so as to develop proper supportive therapy and to explore the insight of the disease.
- 4) Network research project on camel should be initiated. Diseases particularly viral diseases, protozoan, GI helminthes, different deficiency diseases should be considered to widen the prospect of these 'slow developing yet calamniating process'.
- 5) Diseases like Toxoplasomosis, Hydatidosis, TB/HS/BT/Orf/Camel pox, calf diarrhrea, should also be given importance in future studies.
- 7) Camel immune system should be exploited to its full length for the better utilization for human being.
- 8) Frequent interaction/ extension of technological know-how in terms of training/seminars/workshops be organized in future.



Joining

1. Dr Sumant Vyas, Senior Scientist (Ani. Reproduction) resumed duty after availing leave for post-doctoral fellowship at INRA centre de Tours, Nouzilly, France on 1/9/2007.
2. Sh. Raj Kumar joined as Assistant Finance & Accounts Officer on 31/8/2007.

Superannuation

1. Shri Satpal, Assistant Finance & Accounts Officer, retired after attaining superannuation age on 30/04/2007.
2. Dr G. P. Singh, Principal Scientist (Ani. Nutrition)

retired after attaining superannuation age on 30/6/2007.

Deputation/ Lien

1. Dr Raghvendra Singh, Senior Scientist (Ani. Biochemistry) was relieved to join on deputation (upon selection) as Professor of Biotechnology, College of Biotechnology, Sardar Vallabh Bhai Patel University of Agriculture and Technology, Modipuram, Meerut.

Distinguished Visitors

- 4/4/2007 Mr Alok Gupta, Collector & DM, Bikaner
 18/5/2007 Prof. M.P. Poonia, Principal Govt. Engineering College, Bikaner
 22/5/2007 Dr Pratap Narain, Vice- Chancellor, RAU, Bikaner
 25/6/2007 Dr C. S. Prasad, ADG (AN&P), ICAR
 3/8/2007 Dr Suresh Choudhary, MLA, Bhadra, Rajasthan
 16/8/2007 Prof. Utpal Tatu, Associate Professor, Biochemistry, Indian Institute of Science, Bangalore
 6/10/2007 Mr S.K. Garg, ex- Vice Chancellor, Pandit Deen Dayal Upadhyay Pashu Chikitsa Vishwavidyalaya, Mathura
 18/10/2007 Justice S. S. Jha, Judge, High Court, Jabalpur, M.P.
 2/11/2007 Justice Pranab Kumar Chattopadhyaya, Judge High Court, Kolkatta
 20/11/2007 H.E. Sh. S.K. Singh, Governor, Rajasthan
 25/11/2007 Shri P.P. Mathur, IAS, Additional Secretary & Finance Advisor, Ministry of Agriculture, Department of Agriculture, Government of India
 3/12/2007 Dr K.P.R. Vittal, Director, CAZRI, Jodhpur
 7/12/2007 Dr Nagendra Sharma, Vice Chancellor, SKUAST (J) Jammu (J&K)
 28/12/2007 Dr N. K. Tyagi, Member ASRB, New Delhi
 6/2/2008 Shri G.S. Kang, Ex Chief Secretary, Rajasthan
 23/2/2008 Dr Mangala Rai, DG, ICAR & Secretary, DARE, Govt. of India.
 7/3/2008 Dr S.N. Pandey, ADG (Hort.) ICAR, New Delhi.
 9/3/2008 Dr H.P. Singh DDG (Hort.), ICAR, New Delhi.
 21/3/2008 Dr K.M. Bujarbaruah DDG (AS), ICAR, New Delhi.





Personnel

Director

Prof. K.M.L. Pathak, Director

Principal Scientist

Dr. G. P. Singh, Animal Nutrition (Up to 30.6.2007)

Dr. Aminu Deen, Animal Physiology

Senior Scientist

Dr. A. K. Nagpal, Animal Nutrition

Dr. S. K. Ghorui, Veterinary Parasitology

Dr. S. K. Dixit, Veterinary Medicine

Dr. A. K. Roy, Animal Physiology

Dr. Sumant Vyas, Animal Reproduction

Dr. Raghvendra Singh (on deputation)

Dr. S. C. Mehta, Animal Genetic and Breeding

Dr. F. C. Tuteja, Veterinary Medicine

Dr. Gorakh Mal, Animal Biochemistry

Dr. (Mrs.) D. Suchitra Sena, Veterinary Medicine

Dr. C. Bhakat, Livestock Production Management

Dr. (Mrs.) Nirmala Saini, Animal Nutrition

Scientist

Dr. G. Nagarajan, Animal Biotechnology

Technical

Dr. U. K. Bissa, Sr. Veterinary Officer, T-9

Dr. N. Sharma, LSF, T-9

Sh. Ram Kumar, Farm Manager, T-9

Dr. B. L. Chirania, Veterinary Officer, T-7-8

Sh. Ram Dayal, Technical Officer, T-6

Sh. Dinesh Munjal, Technical Officer, T-6

Sh. M. K. Rao, Technical Officer, T-5

Sh. Nanad Kishor, Technical Officer, T-5

Sh. Mohan Singh, Technical Officer, T-5

Administration

Sh. K. P. Sharma, Assistant Administrative Officer

Sh. Satyapal, Assistant Finance & Accounts Officer
(Up to 30.4.2007)

Sh. Raj Kumar, Assistant Finance & Accounts Officer
(31/8/2007 onwards)







Infrastructure Development

During the reported period following works were completed,

1. Pavement of roads in the campus was made with cement blocks.
2. Renovation of the main gate of the campus/office.
3. Construction of security hut at the main gate.
4. Information stone in Hindi and English for visitors.
5. Compound wall around the electric sub station.
6. Plantation of Neem tree on the road leading to centre.
7. Construction of Camel draught based electrical generation unit.
8. Construction of canteen.
9. The landscape of the centre was improved by constructing new lawns and increasing the size of existing lawns.



राजभाषा संबंधी कार्यक्रम

हिन्दी पखवाड़ा, 2007

हिन्दी दिवस के शुभ अवसर पर राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर में दिनांक 14-28 सितम्बर तक हिन्दी पखवाड़ा मनाया गया। पखवाड़े के शुभारंभ पर मुख्य अतिथि डॉ. भगवान दास किराडू, प्राचार्य, नेहरू शारदा पीठ महाविद्यालय, बीकानेर ने कहा कि भाषा सहज व सरल होगी तो तेजी से विकसित होगी तथा अच्छे, सरल व सहज शब्द सदैव अमर रहते हैं।

कार्यक्रम के अध्यक्ष व केन्द्र निदेशक प्रो. कृष्ण मुरारी लाल पाठक ने इस शुभ अवसर पर सभी को बधाई देते हुए कहा कि हम अपनी मातृभाषा में भावों की अभिव्यक्ति जितनी सहज ढंग से कर सकते हैं उतनी शायद किसी भी अन्य भाषा में नहीं। राजभाषा अनुभाग प्रभारी डॉ. अश्विनी कुमार रॉय ने हिन्दी दिवस के सन्दर्भ में प्रकाश डाला।

पूरे पखवाड़े के दौरान हिन्दी में निबंध प्रतियोगिता, लिखित सामान्य ज्ञान प्रश्नोत्तरी, राजभाषा पत्रिका 'करम' 2007 का सर्वश्रेष्ठ आलेख/कविता पुरस्कार एवं सांस्कृतिक गतिविधियाँ आयोजित की गईं।

हिन्दी पखवाड़ा 2007 के समापन समारोह के अवसर पर मुख्य अतिथि के रूप में डॉ. अनिल कुमार, अधिष्ठाता, स्नातकोत्तर पाठ्यक्रम, राजस्थान कृषि विश्वविद्यालय, बीकानेर ने कहा कि आज शोध पत्रों को हिन्दी में प्रस्तुत किया जा रहा है जो कि प्रशंसनीय है। मुख्य अतिथि के कर कमलों से केन्द्र द्वारा प्रकाशित लघु पुस्तिका 'मैं ऊँट हूँ' का विमोचन किया गया।



इस अवसर पर विशिष्ट अतिथि के रूप में भारतीय जीवन बीमा निगम, बीकानेर की सहायक प्रशासनिक अधिकारी श्रीमती संगीता सेठी ने कहा कि इस केन्द्र के वैज्ञानिक साहित्य को देखें तो यह कहने में कोई अतिशयोक्ति नहीं होगी कि अब तकनीकी ज्ञान के क्षेत्र में भी हिन्दी पीछे नहीं है।

समापन समारोह के अध्यक्ष के रूप में केन्द्र निदेशक

प्रो. कृष्ण मुरारी लाल पाठक ने हिन्दी भाषा के सरलीकरण की बात पर जोर देते हुए कहा कि हमें भाषा में शब्दों की क्लिष्टता से बचना चाहिए।

मुख्य अतिथि, विशिष्ट अतिथि व केन्द्र निदेशक द्वारा हिन्दी पखवाड़ा के अन्तर्गत आयोजित प्रतियोगिताओं के विजेताओं को पुरस्कार व प्रशस्ति-पत्र वितरित किए गए।

प्रथम राजभाषा कार्यशाला

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर के चौबीसवें स्थापना दिवस समारोह के उपलक्ष्य में केन्द्र सभागार में 5 जुलाई, 07 को एक दिवसीय राजभाषा कार्यशाला का आयोजन किया गया।

कार्यशाला के प्रारम्भ में केन्द्र के राजभाषा अनुभाग के प्रभारी डॉ. अश्विनी कुमार रॉय द्वारा आयोज्य कार्यशाला के उद्देश्य व महत्व पर प्रकाश डाला गया।

कार्यशाला में अतिथि वक्ता के रूप में पधारे जनकवि श्री हरीश जी भादाणी, वरिष्ठ साहित्यकार, बीकानेर ने 'हिन्दी साहित्य में कविता का स्वरूप' विषयक व्याख्यान तथा डॉ० भगवान दास किराडू, प्राचार्य, नेहरू शारदा पीठ महाविद्यालय, बीकानेर ने 'हिन्दी साहित्य में कर्म और उत्साहवर्धन' विषयक दूसरा व्याख्यान प्रस्तुत किया।

स्थापना दिवस के इस महत्वपूर्ण अवसर पर केन्द्र के निदेशक डॉ. के.एम.एल.पाठक ने अपने अभिभाषण में कहा कि हिन्दी भाषा एक ऐसी भाषा है जो समाज, देश को आपस में जोड़ती है, एक-दूसरे को सूत्र में पिरोती है।

द्वितीय राजभाषा कार्यशाला

केन्द्र में आयोजित द्वितीय एक दिवसीय राजभाषा कार्यशाला में 1 मार्च, 2008 के दिन मुख्य अतिथि के रूप में डॉ. सी.बी. गेना, माननीय कुलपति, बीकानेर विश्वविद्यालय, बीकानेर ने कहा कि जीवन में कैंसी भी प्रतिकूल परिस्थिति हो, अनुकूलन आवश्यक है। इसी से जीवन को सार्थक व सफल बनाया जा सकता है।

मुख्य वक्ता के रूप में डॉ. अरविन्द कुमार पुरोहित, निदेशक, अकादमिक कर्मचारी महाविद्यालय एवं दूरस्थ शिक्षा, राजस्थान कृषि विश्वविद्यालय, बीकानेर ने 'हिन्दी भाषा में विज्ञान के काव्यात्मक सम्प्रेषण की क्षमता' विषयक व्याख्यान प्रस्तुत करते हुए कहा कि समय की महत्ती आवश्यकता है कि हम हिन्दी भाषा को वैज्ञानिक कार्यों से जोड़ने में सफल हो।

इस अवसर पर केन्द्र निदेशक डॉ. के.एम.एल.पाठक ने कहा कि हिन्दी भाषा में हर प्रकार के विषयों को अभिव्यक्त करने की अदभुत क्षमता है। अतः हमारा उद्देश्य यह है कि हिन्दी भाषा को उत्तरोत्तर आगे बढाएं

केन्द्र के हिन्दी प्रकाशन

- (1) मैं ऊँट हूँ (द्विभाषी)
- (2) राजभाषा वार्षिक पत्रिका 'करम' का पांचवां अंक





