वार्षिक प्रतिवेदन
ANNUAL REPORT
2006-07

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

Published by
Prof. K.M.L. Pathak
Director

Editorial Board
Dr. Aminudeen
Dr. S.C. Mehta
Dr. S.K. Dixit
Dr. (Mrs.) D. Suchitra Sena
Shri Dinesh Munjal

Hindi Translation
Dr. A.K. Roy
Shri Nemichand

Published
October 2007

Printed by
R.G. Associates
Bikaner -334001
Mob. 9414603856

National Research Centre on Camel
Post Box - 07, Jorbeer, Bikaner - 334 001
Phone : 0151-2230183, Fax 0151-2231213
e-mail : nrccamel@nic.in
website : www.icar.org.in/nrccm/home.html

वार्षिक प्रतिवेदन
ANNUAL REPORT
2006-2007

निदेशक - प्रोफेसर के. एम. एल. पाठक

Director - Prof. K.M.L. Pathak

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र

(भारतीय कृषि अनुसंधान परिषद्)

जोरबीड़, बीकानेर-334 001, राजस्थान, भारत

National Research Centre on Camel

(Indian Council of Agricultural Research)

Jorbeer, Bikaner-334 001, Rajasthan, India

CONTENTS

Preface

It gives me immense pleasure in presenting the Annual Report of the NRCC, which highlights the important activities of the centre and salient achievements made during the year 2006-07.

The Centre made a modest beginning during the last phase of VI Plan as 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 of camel and generated base line data. The change of scenario in agriculture and livestock sector, particularly in terms of a shift towards mechanization and chemical intensive production, certain trends were witnessed in pattern of animal raising also. In case of camel, an inclination is being observed towards decrease in camel keeping and a concomitant fall in camel population are also observed.

The NRCC is a world class premier research centre for research and development of camel and provide leadership through basic and applied multi-disciplinary research and training and also acts as a national repository of information on camel. The centre is pursuing its activities under seven units, viz. camel breeding and genetics, camel physiology, biochemistry and reproduction, camel nutrition, camel health, camel management and extension, camel farming and agro-forestry.

The year 2006-07 brought in several useful informations which include microsatellite based genetic characterization of camel breeds, cloning and sequencing of promotor region of camel milk lactalbumin gene, artificial impregnation of female camels, unique sperm depot in camel semen for prolonged viability of spermatozoa, protein profiles of seminal plasma, endocrine investigations into unexplored aspects of male and female reproduction, a new primer based PCR diagnosis of trypanosomosis, nutritional requirements for higher milk production in camels, feed and fodder evaluation for mineral profiles at farmer's door, intensive vs semi intensive system of management for calf rearing and immunity profiles of calves. M-cure, a herbal formulation has been developed for treatment of camel mange.

I wish to express my sincere appreciation to all scientists for supplying the requisite information to enable us to prepare this report. Thanks are due to former Directors Dr. M.S. Sahani and Dr. G.P. Singh (Actg.) for their tremendous efforts made towards achieving the targets. The dedication and sincere efforts made by members of publication committee, In-charge PME Cell, PIs of various projects, other scientists, technical and administrative staff in bringing out this Annual Report 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 great help in tuning the research programmes and activities of this centre.

I am indebted to Dr. Mangala Rai, Hon'ble Secretary, DARE and DG, ICAR for his kind patronage to our pursuits. 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 (AN&P) and Dr. T.J. Rasool, ADG (AP&B). Former DDG (AS) Dr. V.K. Taneja, Dr. S. Ayyappan, DDG (AS) and Dr. O.P. Dhanda, ADG (AN&P) have always been source of inspiration and encouragement.

I hope the information contained in the Annual Report will be useful to all those involved in camel research and development programme in the country. I shall look forward to any suggestions and comments on the information contained in this publication, which would prove to be very valuable for future activities.

(Prof. K.M.L. Pathak)
Director


राष्ट्रीय
प्रशासनि
2007

विशिष्ट सारांश

राष्ट्रीय उष्ट्र अनुसन्धान केन्द्र, उष्ट्र पालन के क्षेत्र में इसकी आवश्यकतानुसार अनुसन्धान व विकास को बढ़ावा देने हेतु सन् 1984 से कार्यरत संस्था है। यह केन्द्र इस समय ऊँटो में कृत्रिम गर्भाधान, जनन संबंधित हारमोनो के मापन हेतु विकिरण प्रतिजैविक मापन प्रणाली पर आधारित तरीकों, उष्ट्र वीर्य व वीर्य द्रव में पाये जाने वाले प्रोटीनों की पहचान, माइक्रो सेटेलाइट आधारित ऊँट की विभिन्न नस्लों की पहचान, गुणात्मक एवं मात्रात्मक आनुवांशिक लक्षणों का अध्ययन, उष्ट्र दुग्ध जीन के प्रवर्तक भाग की आणविक प्रतिलिपि, विश्लेषण व पहचान, उष्ट्र दुग्ध प्रोटीनों की लाभदायक उपयोगिता, बछड़ा पालन के विभिन्न प्रबन्धन तरीकों की उपयोगिता, पोलिमरेज शृँखला अभिक्रिया व सीरोलॉजिकल परीक्षण आधारित तिबरसा रोग का निदान, उष्ट्र बछड़ों में रोग निरोधक क्षमता, हर्बल रोग निरोधक, उष्ट्र खुजली के उपचार हेतु हर्बल दवाई, थनैला रोग के रोकथाम हेतु प्रति-ऑक्सीकारकों का उपयोग, उष्ट्र दुग्ध उत्पादन की वृद्धि हेतु खाद्य संश्लेषण एवं कृषक द्वार पर उपलब्ध खाद्य पदार्थों के लवण पोषक तत्व स्तर का मापन जैसे विषयों पर अनुसंधान कार्य कर रहा है।

ऊँटों में कृत्रिम गर्भाधान – ऊँट के वीर्य गुणों का अध्ययन एवं मादा ऊँटों में कृत्रिम गर्भाधान परीक्षण किया गया । वीर्य को घूर्णक मशीन में घूर्णन कर शुक्राणु गोलिका प्राप्त की। यह पाया कि शुक्राणु पेलेट एक धागे सदृश्य जैली है जो न तो द्रवित होती है, न ही बफ़र में घुलती है। इस शुक्राणु गोलिका से शुक्राणु निकलते हुए सूक्ष्मदर्शी यंत्र में देखे जा सकते हैं। शुक्राणुओं का संरक्षण इस गोलिका में अपेक्षाकृत दीर्घ काल तक बना रहता है। कृत्रिम गर्भाधान में 10 मादा ऊँटो पर कुल 13 बार गर्भाधान प्रयत्नों में से इस वर्ष 3 मादाओं ने गर्भधारण किया। कृत्रिम गर्भाधान में अधिक सफलता प्राप्त करने हेतु संभावित परिवर्तनों पर अध्ययन की आवश्यकता है।

जनन सम्बन्धित हारमोनो के मापन हेतु विकिरण प्रति जैविक विश्लेषण (आर.आई.ए.) पर आधारित विधियों का विकास :- नर व मादा जनन एन्डोक्राइनोलोजी क्षेत्र में अण्डकोष में अण्डों के परिवर्धन व विकास, नर सम्भोग क्षमता व कृत्रिम योनि में सम्भोग में रूचि से सम्बन्धित कुछ हारमोनों का अध्ययन किया गया। यह पाया गया कि बिना गर्भ/सम्भोग वाली मादा ऊँटो में इस्ट्राडायोल हारमोन का स्तर अन्य पशु प्रजातियों की तुलना में अधिक होता है। इस्ट्राडायोल की उच्चतम मात्रा भी अन्य पशुओं की तुलना में अधिक है। परिसंचारित इस्ट्राडाइऑल की सान्द्रता तरंग गति की भांति क्रमिक रूप से कम ज्यादा होती रहती है। कृत्रिम योनि में सम्भोग में अत्यधिक रूचि रखने वाले नर ऊँटो के टेस्टोस्टीरोन व इस्ट्रडाइऑल हारमोनों की सान्द्रता की तुलना उन ऊँटो से की गयी जिन्हें कृत्रिम योनि में सम्भोग करने में पूर्ण अरूचि व कम रूचि पायी गयी। परिणाम यह दर्शाते हैं कि एक ऊँट जिसमें कृत्रिम योनि में सम्भोग में पूर्ण अरूचि थी, के परिसंचारित टेस्टोस्टीरोन व इस्ट्राडाइऑल हारमोनों का स्तर अत्यधिक सम्भोग में रूचि वाले ऊँटों से कम नहीं था। यह ऊँट बाड़े में खुला छोड़ने पर मादा ऊँटों का पीछा करता था, इस आधार पर इसे मनोवैज्ञानिक ह्रास का मामला माना गया। अन्य ऊँट जिसकी सम्भोग प्रवृत्ति में कम रूचि आंकी गयी, में हारमोनों की सान्द्रता में सर्ज अपेक्षाकृत देरी से पाया गया।

वीर्य व वीर्य द्रव में प्रोटीन पदार्थों की पहचान : प्रोटीन पदार्थों से सम्बन्धित अध्ययन से स्पष्ट हुआ कि ऊँट के वीर्य में उच्च अणु भार वाले प्रोटीन वीर्य संकलन के 18 घंटे बाद तक बने रहते हैं, तत्पश्चात उनके विखण्डन से अपेक्षाकृत कम अणु भार के प्रोटीन उत्पन्न होते हैं। वीर्य द्रव में 2 से 4 प्रोटीन अधिक मात्रा में तथा कुछ और सूक्ष्म मात्रा में पाये जाते हैं। वीर्य द्रव के प्रोटीन विभिन्न ऊँटो में असमान पाये गये।

माइक्रोसेटेलाइट आधारित उष्ट्र नस्लों की पहचान : 28 माइक्रो सेटेलाइट बिन्दुओं को सफलतापूर्वक परिवर्धित किया गया है, उनमें से भारतीय ऊँट की नस्लों में 18 ने बहुरूपता प्रदर्शित की हैं। बहुरूपता युक्त बिन्दुओं में एलीलों की संख्या 2 से 7 आंकी गयी है। अपेक्षित विषमता 0.289 से 0.816 तक आंकी गयी। बहुरूपी सूचना अंश 0.267 से 0.791 तक आंका गया। नी'ज के आनुवांशिक दूरी मापन से वंश वृक्ष का निर्माण किया गया। अन्य तरीकों का भी इस्तेमाल कर यह निष्कर्ष निकाला गया कि भारतीय ऊँट की नस्लों में घनिष्ठ जातिगत सम्बन्ध है।

भारतीय ऊँटो में गुणात्मक व मात्रात्मक आनुवांशिक लक्षणों का अध्ययन : नस्ल, लिंग व वर्ष के शारीरिक भार व वृद्धि पर संभावित प्रभावों का अध्ययन यह दर्शाता है कि नस्ल का ऊँट के ऊपर वर्णित लक्षणों पर सिर्फ 3 माह व 5 वर्ष की उम्र के अतिरिक्त कोई प्रभाव नहीं पाया। प्रारम्भिक 24 माह, फिर 36 माह व तत्पश्चात 6 वर्ष की उम्र के ऊँटो में लिंग के आधार पर कोई अन्तर नहीं पाया गया जबकि अन्य उम्र के ऊँटों में नर ऊँटो का शारीरिक भार व वृद्धि मादा ऊँटों से अधिक आंकी गयी। इस वर्ष औसत जन्म के समय बछड़ों का भार पूर्व वर्षों की तुलना में अधिक था। इस वर्ष गर्भधारण दर 76.47 प्रतिशत थी, जिसमें से 90 प्रतिशत ने बछड़ों को जन्म दिया। केन्द्र के पशुओं के मृत्यु कारणों में आहार तन्त्र के विकार 40 प्रतिशत तक पाये गये। एक सर्वेक्षण के अनुसार मेवाड़ में 2562 मादा ऊँटो से दूध निकालकर बेचा जाता है। प्रति दिन विक्रय किये जाने वाले दूध की मात्रा 70675 लीटर है। प्रति दिन विक्रय से होने वाली आय रू. 5,26,343 आंकी गयी।

उष्ट्र के दुग्ध प्रोटीन जीन के वर्धक की आणविक प्रतिलिपि तैयार कर विश्लेषण व इसके लक्षणों का अध्ययन : एल्फा लेक्टएल्बुमिन व बीटा केजीन जीन वर्धक अंशो का परिवर्धन कर लक्षणों का अध्ययन किया। ई. कोलाई जे एम 109 प्राप्त कर उपयुक्त कोशिका बनायी गयी। वर्धक अंश की प्रतिलिपि तैयार कर प्रविष्ट व उत्पन्न अंशो को परिलक्षित किया गया। प्रतिकृतित अंश का क्रमांकन करवाया गया जिनके रजिस्ट्रेशन सं. AM 259943 (1799 bp) व AM 259960 (812 bp) हैं।

ऊँट के बछड़ों के पालन हेतु विभिन्न प्रबन्धन तन्त्र : ऊँट के बछड़ों को 7-10 महीनों की आयु में उच्च कोटि के प्रबन्ध तन्त्र जिसमें सरस गोल्ड नामक पशु आहार 1 कि.ग्रा. प्रतिदिन प्रति ऊँट देने पर यह पाया गया कि अन्य प्रबन्ध तन्त्र की तुलना में इन पशुओं में घास व जल ग्रहण, वृद्धि दर तथा कुल शारीरिक भार ग्रहण अधिक पाया गया। यद्यपि उच्च कोटि के प्रबन्ध तन्त्र में खाद्य पर व्यय अधिक आता है, लेकिन प्रति कि.ग्रा. वृद्धि दर की कीमत उच्च कोटि के प्रबन्धन में अन्य प्रबन्ध तन्त्र की तुलना में कम पायी गयी। ग्लोबुलिन, कुल प्रोटीन एवम ट्राइग्लिसराइड के स्तर उच्च कोटि प्रबन्ध वाले बछड़ों में अधिक पाये गये। इसी प्रकार एक समान प्रकार के अन्य प्रयोग में 14 से 18 माह की आयु के बछड़ों को अन्य प्रबन्ध तन्त्र में 6-7 घंटे के घास चरने के भ्रमण के अतिरिक्त जब उच्च कोटि प्रबन्ध वाले खाद्य पदार्थ उपलब्ध करवाये, तो उनकी वृद्धि दर उन बछड़ो से अधिक आंकी गयी जिन्हे खाद्य पदार्थ तो उच्च कोटि समूह वाले प्रदान किये परन्तु घास चरने के भ्रमण से वंचित रखा गया।

पोलिमरेज श्रृंखला अभिक्रिया एवं सिरोलॉजिकल परीक्षणों पर आधारित तिबरसा रोग का निदान : पहले से परीक्षित तिबरसा से ग्रसित पशुओं के डी.एन.ए. नमूनों की सहायता से एक नये प्राइमर का उपयोग कर डी.एन.ए. परिवर्द्धन किया गया जिसमें 540 क्षार युग्मों का एक परिवर्धित अंश प्राप्त हुआ, जिसका उपयोग तिबरसा रोग के निदान हेतु किया जा सकता है।

उष्ट्र खुजली हेतु हर्बल दवा : कृषकों के क्षेत्र में आम तौर पर उपलब्ध सामग्री का उपयोग करते हुए दो हर्बल दवाएँ तैयार की

गयी। इन दवाओं का परीक्षण सारकोपटिक खुजली रोग के उपचार क्षमता हेतु किया गया। पहला सूत्र खुजली कृमियों को खत्म करने में प्रभावी पाया गया। दूसरा सूत्र भी खुजली रोग को खत्म करने में समान रूप से प्रभावी है परन्तु उसमें सम्मिलित अतिरिक्त गुणात्मक अवयवों के लाभदायक प्रभावों का अध्ययन किया जाना शेष है। दोनों ही सूत्र, रोग ग्रस्त पशु को अत्यधिक खाज, चमड़ी के मोटे व झुर्रीदार हो जाने, चमड़ी के फटने जैसे लक्षणों से निजात दिलाकर चमड़ी को सामान्य व चमकदार स्थिति प्रदान करने में प्रभावी है।

थनैला रोग में प्रति-आक्सीकारकों का उपयोग : थनैला रोग से प्रभावित मादा पशुओं को विटामिन 'सी' से उपचार करने पर 46.1 प्रतिशत पशुओं में उपचार सम्भव हो पाया।

दुग्ध उत्पादन वृद्धि हेतु खाद्य संगठन : दुधारू ऊँटो को ग्वार भूसा, मूँगफली चारा व सान्द्र खाद्य मिश्रण 57 : 29 : 14 के अनुपात में मिलाकर 72 दिन तक दुग्ध काल की प्रथम तिमाही में खिलाने पर शुष्क पद्धार्थ ग्रहण 1.99 प्रतिशत व दुग्ध उत्पादन 8.31±0.36 लीटर प्रतिदिन मापा गया। ऊंटों को प्रदत खाद्य पदार्थों में 11.12 प्रतिशत क्रूड़ प्रोटीन एवं 58.6 प्रतिशत कुल पाच्य-पोषक पदार्थ सम्मिलित थे। दुग्ध उत्पादन शुष्क पदार्थ ग्राहयता पर 0.65±0.03 लीटर प्रति कि.ग्रा. आंके गये। इस अध्ययन के दौरान ऊंटों का औसत शारीरिक भार 658. 00±16.37 कि.ग्रा. से घटकर 627.89±17.79 कि.ग्रा. रह गया। औसत शारीरिक भार में कमी की दर 4.58 प्रतिशत आंकी गयी। दुधारू पशुओं के शारीरिक भार में कमी इस बात की द्योतक है कि प्रदत खाद्य संगठन में शारीरिक भार को बनाये रखने हेतु पोषक पदार्थों की कमी है। यह महसूस किया गया कि उच्च दुग्ध उत्पादन क्षमता हेतु उच्च पोषक पदार्थों का समावेश कर अध्ययन किया जाए तो बेहतर रहेगा।

कृषकों के पास उपलब्ध खाद्य पदार्थों में सूक्ष्म व अति सूक्ष्म पोषक तत्वों का अध्ययन

चार कृषि - वातावरणीय क्षेत्रों, बीकानेर, जैसलमेर (1), हनुमानगढ़ व गंगानगर (2), चुरू व नागौर (3) तथा पाली एवं जोधपुर (4) में कृषकों के पास उपलब्ध व ऊंटों द्वारा चरने वाले घास के नमूनों का विश्लेषण उनके निकट विश्लेषण, कोशिका भित्ति संगठन एवं लवण संरचना हेतु किया गया। खाद्य राख की मात्रा 4.25 से 18.90 प्रतिशत, अम्ल अघुलित राख की मात्रा 1.51 से 9.84 प्रतिशत तक आंकी गयी। कैल्शियम, फास्फोरस, मैग्नीशियम एवं मैगनीज की मात्रा ऊंट की आवश्यकता के अनुरूप पायी गयी। लौह तत्व की मात्रा 355-672.9 भाग प्रति दस लाख तक आंकी गयी जो कि आवश्यकता से अधिक प्रतीत होती है। जिंक तत्व भूसे व पेड़ों की पत्तियों में कम मात्रा में पाया गया। कोबाल्ट भूसे में कम पाया गया। इन तत्वों को खाद्य में बाह्य स्रोतों से मिलाकर खिलाने की आवश्यकता महसूस की गयी।

सहयोगात्मक अनुसंधान कार्यक्रम

आर एफ एल पी तकनीक पर आधारित प्रमुख ऊत्तक सगतता जीन संगठन श्रेणी II जीनों का मारवाड़ी घोड़ों में जीन संघटन का अध्ययन : पोलिमरेज श्रृंखला अभिक्रिया के आधार पर MHC-Be व MHC-DRB2 बिंदुओं का सफलतापूर्वक परिवर्धन किया गया। इस कार्य हेतु MHC-Be 1 B2 तथा MHC DRB2, 2a व 2b प्राइमरों का उपयोग किया गया तथा 49 डी.एन.ए. नमूनों के परिवर्धन से 229 व 279 क्षार युग्मों के परिवर्धित अंश प्राप्त हुये।

मानव में पोरफाइरिया रोग-ग्रस्त रोगियों पर आणविक एवं जैव रासायनिक अध्ययन : सात रोगियों के नमुनों के क्षार क्रमांकन किये गये। उनमें से एक क्रमांकन जिसे 677 क्षार युग्मों का पाया गया को एन सी बी आई जीन बैंक में पंजीकृत करवाया गया। पंजीकृत क्रमांक DQ915447 हैं। आठ अन्य रोगियों पर अध्ययन जारी है।


वृक्षारोपण
मंगला राय

1

Executive Summary

NRC on Camel is a premier centre for research and development in frontier areas of camel husbandry while taking full care of the requirements of the camel owners it is contributing significantly to the development of science by generating novel and specific data pertaining to camel. At present, this centre is engaged in research on development of AI in camel, development of RIA facilities for quantitation of reproductive hormones, characterization of proteins in semen and seminal plasma, micro-satellite based characterization of different camel breeds, evaluation of qualitative and quantitative genetic parameters of Indian camel breeds, molecular cloning, characterization and promoter analysis of the camel milk protein gene(s), evaluation of camel milk protein for useful applications, evaluation of different management systems for rearing camel calves, polymerase chain reaction and serological test based diagnosis of trypanosome infection, immunity aspect of camel calves, herbal immunomodulator, herbal formulations for camel mange, anti-oxidant therapy for mastitis, feed formulation for increased milk production and macro and micro nutrient deficiencies in feed and fodders at farmer's doorstep.

Development of AI in camel

Properties of camel semen were analyzed and artificial impregnations of female camels were attempted. Centrifugation of semen revealed that sperm pellet is thread like gel in appearance, which remained non-miscible with buffer and does not liquefy. Spermatozoa evacuating from sperm pellet could be demonstrated under microscope. Preservability of spermatozoa was observed to be relatively longer. Artificial impregnation trial resulted in 3 successful pregnancies out of 10 female camels attempted for a total of 13 inseminations.

Development of RIA facilities for quantitation of reproductive hormones

Male and female reproductive endocrinology was studied in relation to ovarian follicular dynamics, male sexual libido and willingness to copulate in artificial vagina. Estradiol profiles of unmated female camels revealed higher circulating levels as compared to other

domestic species of livestock. Peaks were also greater in magnitude. Alternate up and down circulating estradiol concentration in wave form was observed. Cases of absolute psychic inhibition to copulate in artificial vagina in one male camel and reduced sexual performance in another male camel were investigated for their endocrine profiles by comparison with potent males. The results revealed that testosterone and estradiol profiles of the male with absolute psychic inhibition were not inferior to those of potent males, while late arousal of endocrine surge was observed in another male with reduced sexual performance.

Characterization of proteins in semen and seminal plasma

Studies on protein profiles of whole camel semen revealed that higher molecular weight proteins were present up to 18h of collection of semen, after which they degraded in smaller molecular weight proteins. Protein profiles of seminal plasma revealed 2-4 major protein fractions and few minor fractions. Protein profiles of seminal plasma varied individually.

Microsatellite based characterization of different camel breeds

Twenty eight microsatellite loci were successfully amplified and 18 were found polymorphic in Indian camel breeds. The number of alleles ranged from 2 to 7. The expected heterozygosity ranged from 0.289 to 0.816 and the polymorphic information content ranged from 0.267 to 0.791. Phylogenetic tree was constructed from the Nei's genetic distance matrix (GENDIST) using the UPGMA method of clustering by DRAWGRAM program of PHYLIP package. Cavalli Sforza Chord Distance was also calculated. One thousand bootstrapping were done and consensus trees were constructed and the same tree topology was derived with the three methods. Close phylogenetic relationship was observed.

Qualitative and quantitative genetic parameters of Indian camels

The effect of breed, sex and year on body weight and growth of camel was analyzed and found non-significant for breeds except at 3 months and 5 years of age ($P<0.05$), while sex effect was non-significant initially up to 24 months then at 36 months and 6 years of age but for rest of the stages it was significant, with males weighting higher than the females. The effect of year was significant at some stages and non-significant at some other stages. This year the average birth weight of camel calves was higher as compared to preceding years. The calving was 90% and the conception was 76.47%. Digestive system was involved in 40% of the deaths at the farm. The survey on sale of camel milk in the Mewari tract revealed that about 21562 females are in milk at a time in the tract, producing about 70675 litres of milk per day. The revenue generated out of the sale of camel milk has been estimated to be Rs. 5, 26, 343/- per day.

Molecular cloning, characterization, and promoter analysis of the camel milk protein gene(s)

The α-lactalbumin and β-casein gene promoter fragments were amplified and characterized. The *E.Coli* JM 109 line was procured and the competent cells were prepared. The respective promoter fragments were successfully cloned and the inserts were released and characterized. Sequencing of the cloned fragments was carried out. Two sequences have been deposited in the NCBI Gene Bank with accession numbers AM259943 (1799bp) and AM 259960 (812 bp).

Different management systems for rearing camel calves

Camel calves of 7-10 months of age reared under intensive system of management with Saras gold pashu ahar (@ 1 kg / animal / day) had higher fodder and water intake, growth rate and total body weight gain (104.20 kg after 180 days) as compared to those reared under semi-intensive system of management (55.20 kg). Though feeding cost per day per calf was slightly higher in intensive management than semi-intensive management group, but total cost for per kg body weight gain per calf was less and economical in intensive management (Rs 29.17) than semi-intensive management (Rs 33.51). The level of globulin, total protein and triglyceride also increased significantly ($P<0.05$) in intensive management. In a similar experiment on calves of 14-18 months of age, calves reared under semi-intensive management receiving same feed and fodder as in intensively managed group, but in addition these calves were allowed for 6-7 hr grazing along with manger feeding recorded higher body weight gain (85.20 kg after 240 days) than those reared under intensive system of management with guar phalghati *(Cyamopsis tetragonoloba)*, for 4 months and moth chara (*Phaseolus aconitifolius*) for another 4 months (68.95 kg).

Polymerase chain reaction and serological test based diagnosis of trypanosome infection

PCR amplification of known positive DNA samples from camels using new primer yielded an amplicon of 540bp, which can be used for diagnosis of trypanosome infection.

Herbal formulations for camel mange

Two herbal formulations were developed using commonly available ingredients at farmer's door. The formulations were evaluated for their curing efficiency against sarcoptic mange. Formulation F_I was found effective as mangicidal. Formulation F_{II} also had equal coverage against mange with additional qualities, which need some more trials for evaluation. Both formulations relieved the animals from symptoms viz. intense itching, thickening and wrinkling of skin, excoriation etc. and improved skin by conditioning, nourishing and toning.

Anti-oxidant therapy for mastitis

Treatment of female camels suffering from mastitis with ascorbic acid resulted in overall recovery of 46.1 per cent as compared to none in the control group.

Feed formulation for increased milk production

Lactating camels kept on diet consisting of guar straw, groundnut haulms and concentrate mixture (57: 29: 14) to provide 11.12%CP and 58.6% TDN for 72 days during the first to third month of lactation with a dry matter intake of 1.99% yielded milk @ 8.31$\pm$ 0.36 litre per day. The milk production in terms of litre per kg dry matter intake worked out to be 0.65 $\pm$ 0.03. The average body weight of camels declined from 658.00$\pm$16.37 kg at the beginning of lactation to 627.89 $\pm$ 17.79 kg after 72 days of lactation. The body weight loss averaged 4.58 %. Loss in body weight of lactating camels reflected that the present feeding level was short of nutrient supply to maintain the normal body weight. It was felt that higher feeding levels could be tried to exploit greater milk production from camels.

Macro and micro nutrient deficiencies in feed and fodders at farmer's doorstep

Samples of feed and fodders commonly fed and browsed by camels from four agro- climatic zones (zone I:Bikaner, Jaisalmer; zone II:Hanumangarh, Ganganagar; zone III:Churu, Nagaur and zone IV:Pali, Jodhpur) were analyzed for their proximate analysis, cell wall contents and mineral composition to find out deficiency of macro & micro nutrients. The ash content in feeds ranged from 4.25 to 18.90 % while, acid insoluble ash ranged from 1.51-9.84%. Calcium, phosphorus, magnesium, manganese was found adequate to meet requirements of these minerals of camel. Iron content was higher in all tested feeds ranging from 355-672.9 ppm, while zinc was deficient in both straws and tree leaves whereas copper was deficient only in straws. These deficient trace minerals required supplementation in ration.

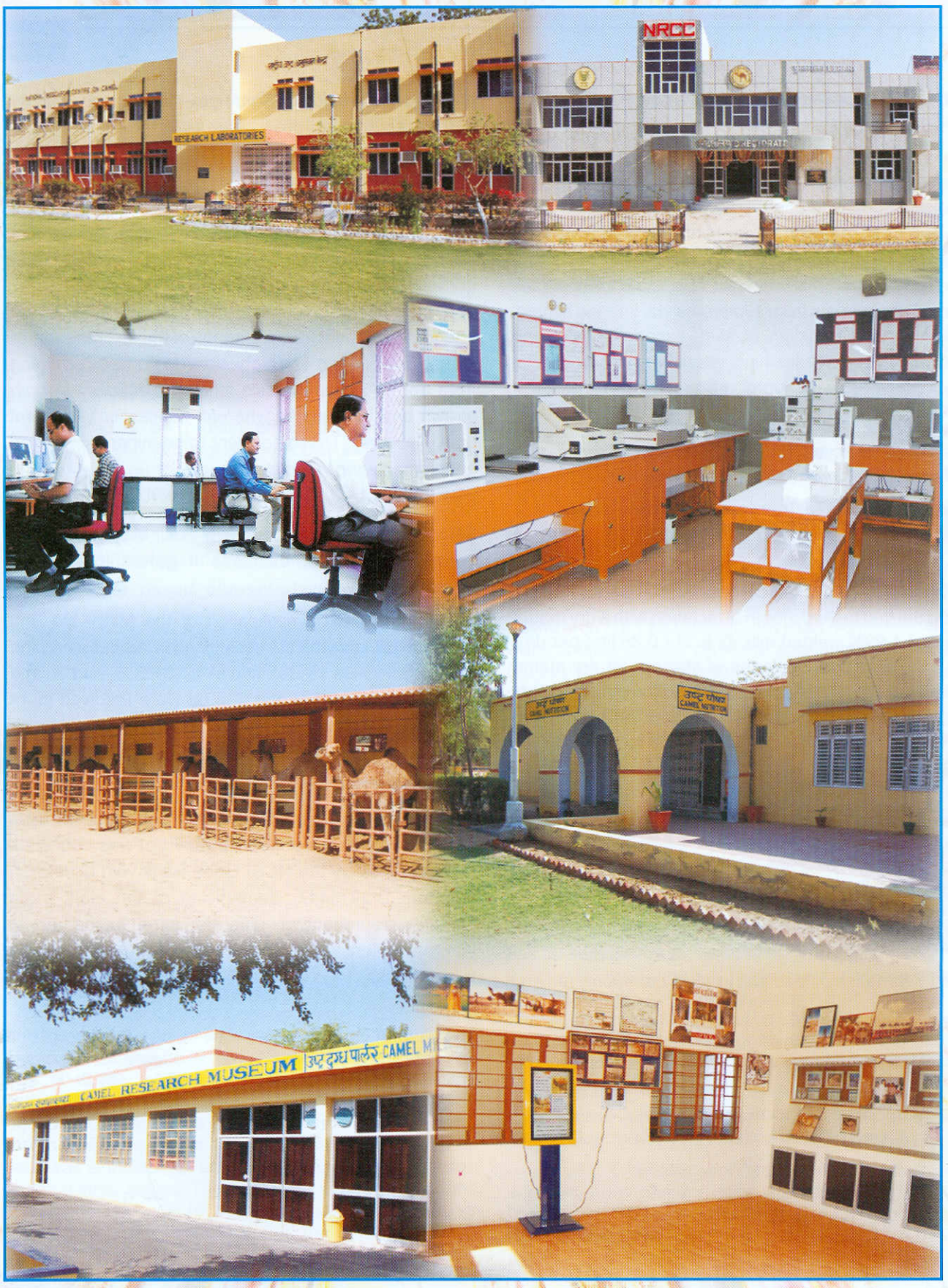
Collaborative research programs

RFLP based genotyping of Major Histo-compatibility complex class II genes in Marwari Horses

The PCR amplification of the MHC- Be and MHC-DRB2 loci was successfully carried out using the primers MHC-Be 1& Be2 and MHC-DRB 2a and 2b and the amplicons of 229 and 276 bp were resolved in 49 DNA samples of Marwari horses.

Molecular and biochemical studies of acute intermittent porphyria in human patients

Sequence analysis of seven samples was carried out and one sequence (677 bp) was deposited and accepted by the NCBI Gene Bank with accession numbers DQ915447. Sequencing of the eight more samples representing different intron/exons or of different patient was carried out. The sequence analysis is in progress.


NRCC
RESEARCH LABORATORIES
CAMEL RESEARCH MUSEUM

2

Introduction

Considering the importance of camel in socio economic development of arid and semi arid zones of the country, the National Commission on Agriculture (1976) recommended establishment of a research institute specially dedicated for camel improvement. Consequently, the Government of India approved a Project Directorate on Camel under the auspices of the Indian Council of Agricultural Research (ICAR) during the last phase of VI Plan. The project Directorate on camel came into existence on 5th July, 1984. The physical facilities consisting of 149 camels of Bikaneri breed and around 824 ha land were transferred by the Government of Rajasthan to the ICAR, available at erstwhile camel breeding farm under the control of Sukhadia University, Udaipur. Later on it was upgraded to National Research Centre on Camel (NRCC) on 20th September, 1995.

The National Research Centre on Camel, Bikaner is located in the Jorbeer area at a distance of about 10 km from Bikaner city. The topography of the area is arid undulating desert with vast range of sand dunes. 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.

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 of camel and generated base line data. Over the years, NRCC has developed excellent infrastructural facilities including modern laboratories and library. The Centre has generated substantial scientific databases and technologies on various aspects of Indian camel. An elite herd of important indigenous camel breeds viz., Bikaneri, Jaisalmeri and Kachchhi has been developed through selective breeding. The Centre has also generated useful information on double humped camel found in Nubra Valley of Laddakh region of Jammu & Kashmir for its conservation and future utility.

The Centre has also been identified as one of the important tourist place of Bikaner and is included in

the tourist map of Rajasthan as well as in various foreign tourist guides. The Centre has developed a unique camel museum, which attracts the attention of researchers and tourists. Every year thousands of foreign and Indian tourists visit the Centre. The Centre has established a camel milk parlour where different camel milk products are available.

Mandate

- 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 following seven units and cells:

Units

- Camel Physiology, Biochemistry and Reproduction
- Camel Health
- Camel Breeding and Genetics
- Camel Nutrition
- Camel Management and Extension
- Camel farming
- Agro-forestry

Cells

- ARIS Cell
- Planning, Monitoring and Evaluating (PME) Cell

Infrastructure

Administrative (ADM) building : The ADM-cum-Library building was inaugurated by Dr. Mangala Rai, Hon'ble Secretary, DARE and DG, ICAR on 26.02.2007. The Director's cell, reception, establishment section, central stores, dispatch section, cash section, committee room, official language section and canteen are located on the ground floor of this building.

Library : The library is situated on the first floor of ADM building. It is well enriched with a good collection of literature and has 6742 reference books. The library subscribes to about 30 Indian and 10 foreign journals, magazine and newspapers. Photocopy facility is available in the library.

ARIS Cell : The ARIS Cell, situated on the first floor of ADM building, is well equipped with the latest software including 512 kbps broadband, 256 kbps VSAT, LAN and a server. In addition, all the scientists are also provided with computers, e-mail and internet facility.

Laboratories : The NRCC has modern laboratories situated in three different complexes. The main research complex has laboratories for camel physiology, camel reproduction and biochemistry, camel breeding & genetics, camel health and camel management. The other complexes have camel nutrition and pathology lab, respectively. These laboratories are equipped with sophisticated instrumental facilities such as automatic DNA sequencer, HPLC, GLC, UV-visible double beam spectrophotometer, atomic absorption spectro-photometer, PCR, universal research microscopes with photographic attachment, stereo zoom research microscope, high speed refrigerated centrifuge, ELISA reader, deep fridge (-20°C to -80°C), Millipore water purification system, cryo-preservator, Co_2 incubator, gamma counter chamber, automatic biochemical analyzer besides other routinely used scientific equipments such as hot air oven, BOD incubators and high precision electronic balances.

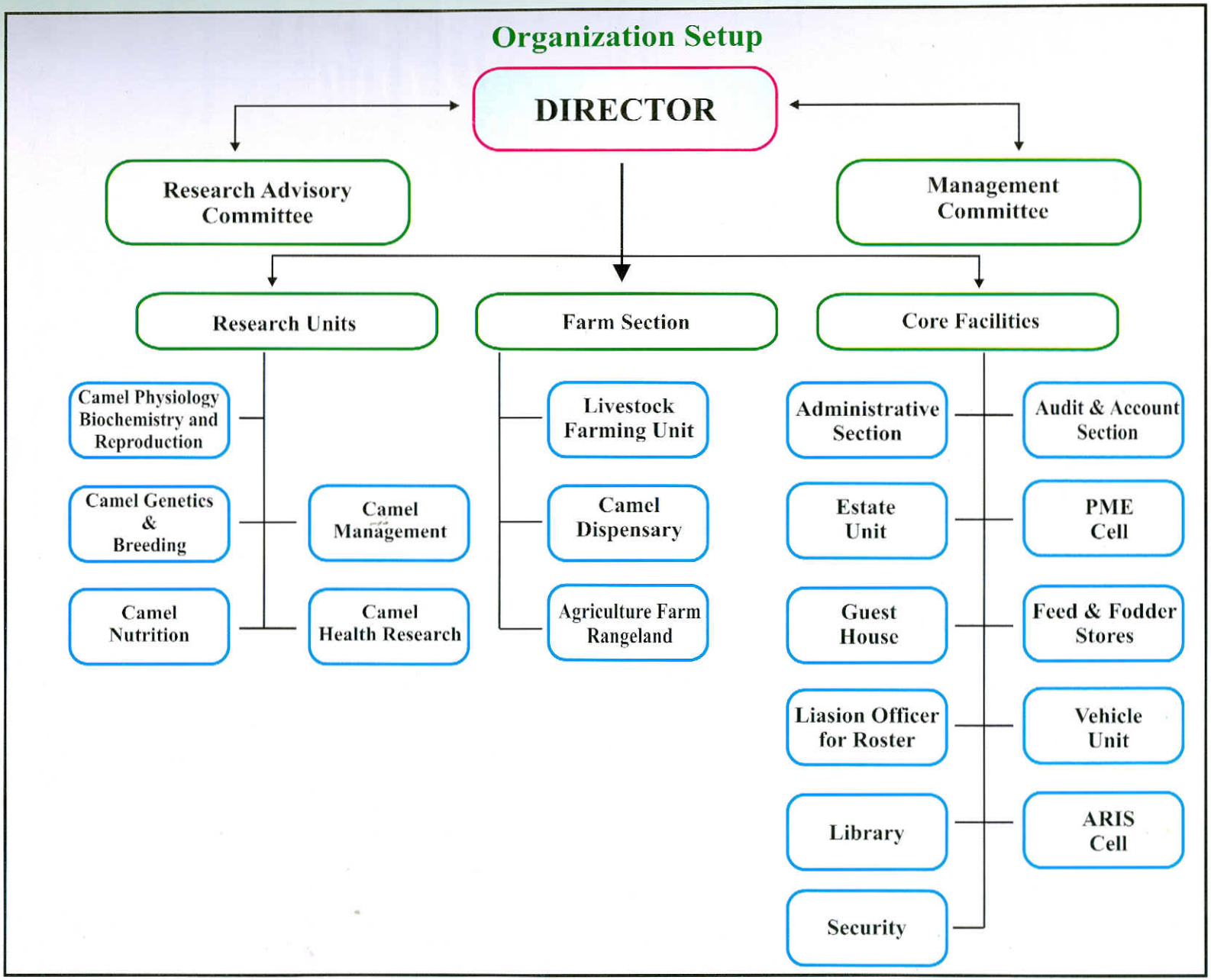
Camel Farm : The farm maintains an elite herd of about 270 camels comprising of Bikaneri, Jaisalmeri and Kachchhi breeds. The farm is equipped with one camel dispensary, six open sheds, six roofed sheds, three camel boxes, one metabolic shed and one shed with provision for individual feeding. The farm has also fodder and feed godown, one feed block making plant and weigh bridge.

Agroforestry : The centre has 659 ha land partitioned in five blocks with three tube wells. About 650 ha of area has been fenced and 45 ha of land has been brought under perennial silvipasture comprising of grasses, shrubs and trees. The main grasses are sewan (*Lasiurus sindicus*) and blue panic (*Panicum antidotale*).

Residential complex : The residential colony comprising of 2 type V, 4 type IV, 5 type III, 9 type II and 13 type I staff quarters is situated at main campus.

Guest house : The centre has one guest house with four A/C and two non - A/C rooms with kitchen, dining and reception.

Camel museum : The centre has one camel museum which offers a visual documentary of cultural, ethical, social, economical and scientific aspects of camel. It possesses the specimens of various utility products made out of camel bones and hide. There is pictorial and iconological depiction of role of camel in history


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

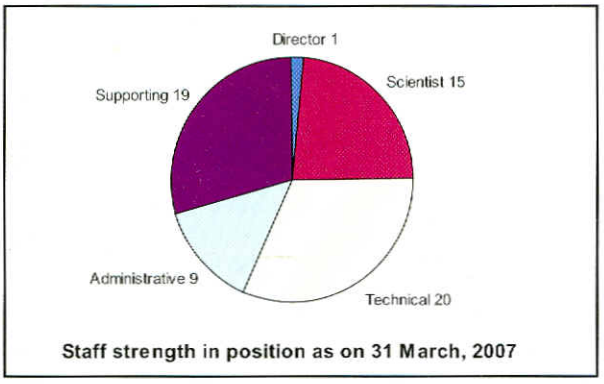
and mythology.

Camel milk parlour : The Centre has established a camel milk parlour where different products such as flavoured milk, lassi, ice-cream, tea and coffee prepared from camel milk are available.

Others: Modern facilities like conference room of 120-sitting capacity equipped with LCD projector and public address system, committee room with 40-sitting capacity are available for holding scientific conference, meetings and group discussions. A spacious community centre has been constructed for playing indoor games and for organizing various functions. Presently it is under furnishing. The ADM building, guest house and all laboratories are provided with uninterrupted power supply by a 33 KV generator set.

Staff position (as on 31st March, 2007)

Cadre	Number of posts sanctioned	Number of post filled
Director	1	1
Scientific	20	15
Technical	21	20
Administrative	10	9
Supporting	19	19
Total	71	64



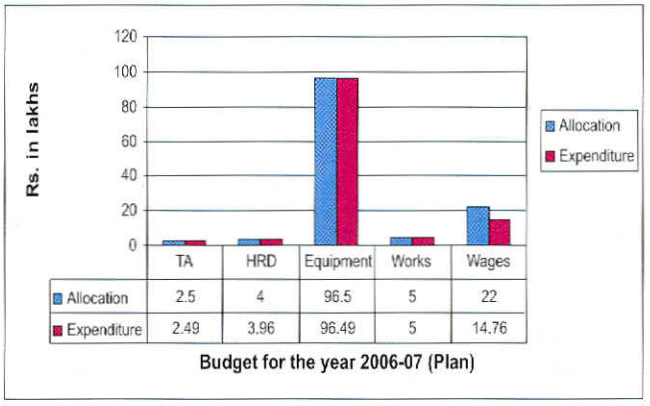
Staff strength in position as on 31 March, 2007

Financial statement (2006-07)

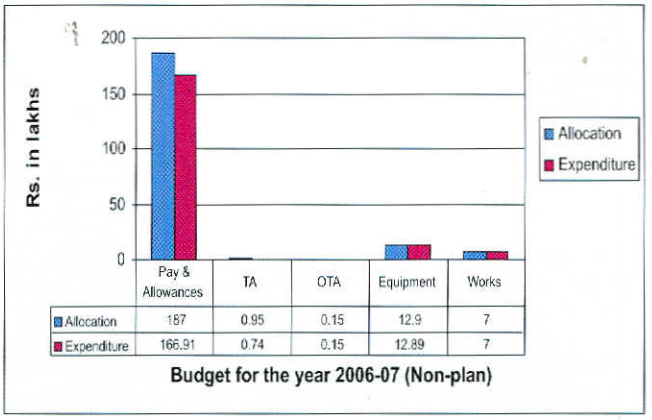
Through regular monitoring, the centre was able to ensure optimal utilization of funds available in the budget. The actual utilization of the budget both under plan and non-plan is furnished below:

(Rs. in lakh)

Head of account	Allocation		Expenditure	
	Plan	Non Plan	Plan	Non Plan
Pay & allowances	0.00	187.00	0.00	166.91
TA	2.50	0.95	2.49	0.74
O.T.A.	0.00	0.15	0.00	0.15
HRD	4.00	0.00	3.96	0.00
Equipment	96.50	12.90	96.49	12.89
Works	5.00	7.00	5.00	7.00
Wages	22.00	0.00	14.76	0.00
Total	130.00	208.00	122.70	187.69

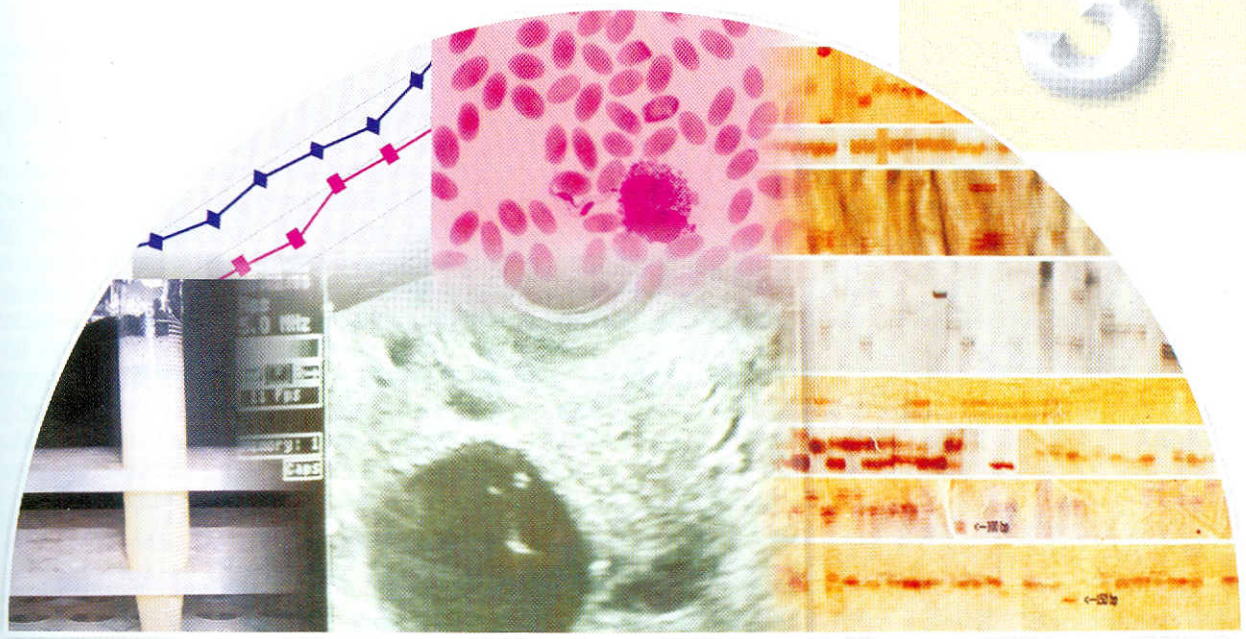


Budget for the year 2006-07 (Plan)



Budget for the year 2006-07 (Non-plan)

Revenue receipt / generation (2006-07) : Rs. 15.57 Lakhs



Research Achievements

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

Unit : Camel Breeding and Genetics

Programme : Genetic characterisation, evaluation and conservation of indigenous camel breeds

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 body weight of camel breeds and sexes was initially recorded at an interval of three months up to the age of 3 years. Thereafter, annual weights were taken up to the age of 20 years. The data was analyzed for breed, sex and year differences for the period 2000-2007 (Table - 1, 2 and 3). The effect of breed was non-significant except at 3 months and 5 years of age ($P<0.05$). The sex effect was non-significant initially up to 24 months then at 36 months and 6 years of age. For rest of the stages it was significant ($P<0.01$) with males weighting higher than the females. The effect of year was significant ($P<0.01$) at some stages and non-significant at some other stages. This year the average birth weight of camel calves was higher as compared to preceding years. However, the weight at 3 months age was little less than the average of last 8 years.

Reproductive parameters

The information on mating and calving performance of the Center's herd for the year 2000 to 2007 is presented in Table - 4. The overall calving was 90%, which is the highest as compared to the performance of last seven years. The calving was 92.31% in Bikaneri, 100% in Jaisalmeri and 66.67% in Kachchhi. This year the conception was 76.47%. This year five rounds of mating were given in contrast to three

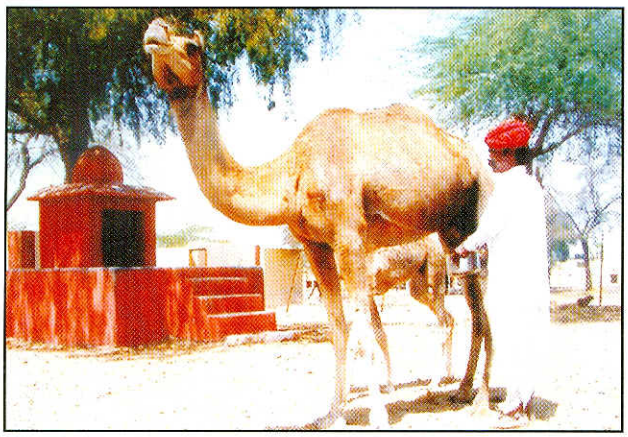
rounds in preceding 7 years. Since camel is an induced ovulator, the breeding practice adopted in past few years was to repeat services after 72 hrs of the first service. However, this year this practice was modified to repeat service after 24 hrs of first service. The number of services required per conception in different breeds is presented in Table - 5.

Mortality at NRCC herd

Breed, sex and age wise mortality for the period April 2006 to March 2007 is presented in Table - 6. In all five Bikaneri, seven Jaisalmeri, six Kachchhi and two Arab-cross camels died. The involvement of digestive system was 40% followed by respiratory system (15%), cardio-vascular system (5%) and urinary system (5%). 20% of the deaths were due to heat stroke (in young calves) and 15% animals were euthanised due to incurable health problems. Both the sexes suffered equally. Among those died during the year 55, 10 and 35% belonged to 0-12 months, 1-3 years and above 3 years age groups, respectively.

Sale of camel milk

The camel breeders of Udaipur, Rajsamand, Chittorgarh, Bharatpur and Alwar districts of Rajasthan and Neemuch and Mandsour districts of Madhya



Pradesh were covered and factual information was collected (Table - 7). The information so collected revealed that of the total camels kept by the breeders, 30-35% are lactating females and about 3.3 liters of milk per female is sold in the market. This is not the actual milk produced by the females, as the milk consumed by the calf and the family members of the camel owner is not included in this figure. The prevailing rate of camel milk in these districts is Rs.7-8/- per liter. This statistics estimates that about 21562 females are in milk at a time, producing about 70675 liters of milk per day which amounts to 23080 thousand liters per annum. The revenue generated out of the sale of camel milk has been estimated to be Rs.526343/- per day. The contribution of camel milk in comparison to the total milk produced by cattle, buffalo and goat was estimated to be 0.97% or roughly about 1%. This figure appears very meager but has great meaning in terms of livelihood and conservation of genetic resources. Apart from feeding its own calf and the family members of the camel breeders, on one hand it is providing livelihood to about 3218 families maintaining approximately 22526 members with average annual income of about Rs.60000/- and on the other hand it is sustaining 56360 camels in its natural habitat and helping us to fulfill our national commitment of conservation of domestic animal diversity.

Camel herd at farm and distribution of germ plasm

The opening balance of Centre's herd was 261 camels and the closing balance was 270 camels. From March 1985 to March, 2007 this Centre has distributed 79 Bikaneri, 8 Jaisalmeri and 1 Kachchhi male for genetic improvement in the field (Table - 8).

Databases

The databases on following aspects of camel have been updated :

1. Inventory of the Centre's camel herd
2. Database on biometry of Centre's herd
3. Reproduction database
4. Health database
5. Production database

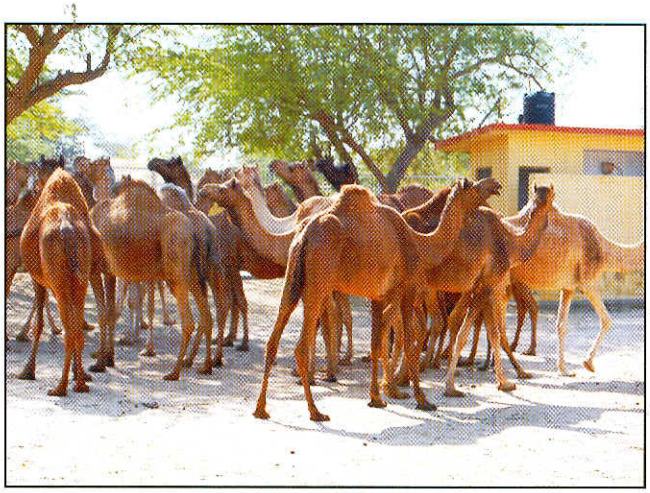


Table - 1: Growth performance of dromedary breeds

(Body weight in kg)

Classes	Birth	3 months	6 months	9 months	12 months	15 months
Pooled	36.69(269)	72.72(237)	135.22(141)	177.80(113)	204.10(128)	227.32 (159)
Breed	NS	*	NS	NS	NS	NS
Bikaneri	38.40(112)	80.08 (99)	140.37 (63)	181.21 (52)	212.67 (58)	240.23 (65)
Jaisalmeri	37.71 (92)	80.91 (82)	143.48 (48)	182.42 (36)	212.02 (47)	240.96 (58)
Kachchhi	37.26 (58)	77.70 (51)	147.01 (28)	180.62 (24)	210.44 (21)	240.36 (34)
Arab cross	33.38 (7)	52.21 (5)	110.03 (2)	166.95 (1)	180.86 (2)	187.73 (2)
Sex	NS	NS	NS	NS	NS	NS
Male	36.78(150)	71.80(130)	131.52 (79)	180.69 (65)	204.63 (66)	233.10 (83)
Female	36.59(119)	73.65(107)	138.92 (62)	175.00 (48)	203.37 (62)	221.53 (76)
Year	**	**	NS	*	NS	NS
2000	34.58 (45)	76.63 (40)	134.81 (33)	181.75 (28)	213.73 (34)	237.57 (31)
2001	35.49 (31)	84.23 (23)	117.59 (8)	187.51 (15)	205.50 (20)	219.26 (23)
2002	34.80 (30)	72.35 (27)	140.94 (27)	192.57 (14)	206.13 (16)	218.74 (24)
2003	37.02 (24)	66.86 (19)	127.21 (20)	158.62 (19)	193.18 (19)	218.02 (17)
2004	36.14 (30)	61.58 (28)	–	–	194.96 (2)	224.12 (24)
2005	36.49 (31)	69.13 (27)	141.43 (18)	172.41 (3)	203.98 (4)	230.35 (12)
2006	39.08 (48)	81.61 (43)	149.36 (35)	173.96 (34)	210.49 (33)	243.18 (28)
2007	39.89 (30)	69.42 (30)				

*(P<0.05) **(P<0.01); NS Non Significant

Table - 2: Growth performance of dromedary breeds

(Body weight in kg)

Classes	18 months	21 months	24 months	27 months	30 months	33 months
Pooled	263.96 (77)	267.27 (71)	276.95 (76)	313.75 (93)	312.57 (63)	353.77 (46)
Breed	NS	NS	NS	NS	NS	NS
Bikaneri	278.06 (29)	278.30 (29)	268.21 (36)	316.83 (40)	307.69 (30)	357.92 (19)
Jaisalmeri	291.64 (28)	271.71 (28)	280.27 (28)	318.83 (31)	300.77 (15)	329.06 (14)
Kachchhi	277.83 (18)	267.85 (13)	274.62 (11)	305.59 (22)	329.25 (18)	374.33 (13)
Arab cross	208.31 (2)	251.22 (1)	284.70 (1)			
Sex	NS	NS	NS	**	**	*
Male	267.23 (39)	274.27 (36)	279.96 (43)	329.30 (41)	328.26 (30)	369.59 (20)
Female	260.69 (38)	260.27 (35)	273.94 (33)	298.20 (52)	296.88 (33)	337.95 (26)
Year	NS	NS	*	NS	**	NS
2000	230.91 (3)	261.97 (20)	281.83 (17)	312.90 (18)	342.43 (23)	365.26 (22)
2001	238.38 (23)	278.49 (17)	290.95 (16)	311.64 (22)	316.49 (12)	349.13 (6)
2002	224.23 (22)	263.00 (15)	311.49 (13)	305.71 (12)	209.91 (3)	-
2003	334.63 (1)	-	222.62 (4)	307.22 (13)	318.26 (7)	386.32 (2)
2004	253.58 (11)	256.85 (3)	261.57 (9)	328.05 (12)	346.36 (14)	340.36 (14)
2005	240.59 (16)	276.05 (16)	293.23 (17)	316.96 (16)	341.98 (4)	327.78 (2)
2006	325.28 (1)					
2007						

*(P<0.05) **(P<0.01) ; NS Non Signifiant

Table - 3: Growth performance of dromedary breeds.

(Body weight in kg)

Classes	36 months	48 months	5 years	6 years	7 years	Adults
Pooled	361.37 (79)	411.50 (85)	467.62 (52)	534.32 (35)	313.75 (93)	590.60 (686)
Breed	NS	NS	*	NS	NS	NS
Bikaneri	361.58 (34)	415.39 (39)	493.99 (22)	559.06 (14)	316.82 (40)	599.94 (346)
Jaisalmeri	341.49 (28)	405.79 (28)	454.60 (19)	545.03 (16)	318.82 (31)	596.35 (215)
Kachchhi	381.04 (17)	413.33 (18)	454.60 (11)	498.87 (5)	305.59 (22)	577.06 (62)
Arab cross	-	-	-	-	-	589.05 (63)
Sex	NS	*	*	NS	**	**
Male	362.27 (38)	425.10 (35)	491.89 (14)	543.09 (6)	329.30 (41)	617.85 (155)
Female	360.47 (41)	397.91 (50)	443.35 (38)	525.55 (29)	298.20 (52)	563.35 (531)
Year	NS	NS	NS	NS	NS	**
2000	381.37 (25)	404.99 (22)	482.07 (12)	512.76 (10)	312.90 (18)	619.98 (5)
2001	368.28 (11)	396.58 (14)	489.68 (15)	545.43 (14)	311.64 (22)	
2002	346.91 (3)	425.85 (11)	485.01 (11)	551.04 (9)	305.70 (12)	
2003	349.37 (17)	416.38 (18)	473.25 (13)	-	307.22 (13)	
2004	352.46 (21)	413.70 (20)	408.08 (1)	528.06 (2)	328.05 (12)	533.74 (4)
2005	369.83 (2)				316.96 (16)	
2006						
2007						

*(P<0.05) **(P<0.01) ; NS Non Signifiant

Table - 4: Reproductive performance of the camel herd (2000-2007)

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%)

Table - 5: Number of services per conception

Classes	Bikaneri	Jaisalmeri	Kachchhi	Pooled
2006-2007				
Available females	26	17	8	51
No. of services	72	42	28	142
Service/female	2.77	2.47	3.5	2.78
Conceived females	19	14	6	39
No. of services	35	32	18	85
Service/conception	1.84	2.29	3	2.18
2005-2006				
Available females	16	12	6	34
No. of services	35	25	15	75
Service/female	2.19	2.08	2.50	2.20
Conceived females	13	11	5	29
No. of services	27	22	11	60
Service/conception	2.08	2.00	2.20	2.07

Table - 6 : Breed, sex, age and system wise mortality at NRCC (Year 2006-2007)

System	Breed				Sex		Age group			Pooled
	Bikaneri	Jaisalmeri	Kachchhi	Arab cross	M	F	0-12 Months	1-3 Years	Above 3 Years	
Digestive	1	2	4	1	5	3	4	1	3	8
Respiratory	1	1		1	1	2	2		1	3
Cardio-vascular		1				1	1			1
Genital										
Urinary		1				1			1	1
Nervous										
Others	3	2	2		4	3	4	1	2	7
Total Mortality	5	7	6	2	10	10	11	2	7	20*

* Out of 20 animals, three were euthanized due to different causes.

Table - 7 : Status of sale of camel milk in southern Rajasthan and adjoining Madhya Pradesh

State	Districts	Camel Milk Producers (N)	Total Camels	Females in Milk	Milk Sold (Litres/ day)	Average (Litres/ female)	Average cost (Rs./Litres)
Rajasthan	Udaipur	36	839	260	869	3.32	7.03
	Chittorgarh	20	1180	434	1400	3.61	7.85
Madhya Pradesh	Neemuch & Mandsour	5	570	172	500	3.10	7.20
	Pooled	61	2589	866	2769	3.39	7.31

Table - 8: Camel Herd Strength (2006-2007)

Breed / Age	Opening 1-04-06		Calving		Purchased		Died		Auction		Raj. Govt.		Army		Closing 31.03.07	
Bikaneri	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0-1 Yr	8	4	9	9				3							9	6
1-2 Yr	3	8					1			2					8	4
2-3 Yr	3	5							2						2	6
3-4 Yr	6	8									4				1	5
>4Yr	12	46						1	1	2	1				12	51
Total	32	71	9	9			1	4	3	4	5				32	72
Jaisalmeri																
0-1 Yr	9	6	7	9			3	2							5	7
1-2 Yr	6	3													8	6
2-3 Yr	4	3													6	3
3-4 Yr	1														4	3
>4Yr	26	39					1	1	1	1	1		1	1	23	36
Total	46	51	7	9			4	3	1	1	1		1	1	46	55
Kachchhi																
0-1 Yr	7	2	6	4			2								5	4
1-2 Yr	3	1					1								6	2
2-3 Yr	6	3													2	1
3-4 Yr	2	2													6	3
>4Yr	5	21			1	5	2	1	1	1					5	26
Total	23	29	6	4	1	5	5	1	1	1					24	36
AxB																
0-1 Yr	1															
1-2 Yr	2								1						1	
2-3 Yr															1	
3-4 Yr																
>4Yr	1	5						2	1							3
Total	4	5						2	2						2	3
Grand Total	105	156	22	22	1	5	10	10	7	6	6		1	1	104	166

Project : Selection for the improvement of draughtability of camel breeds

Project Leader : Dr. S.C. Mehta

Associates : Dr. M.S. Sahani (up to 31.08.2006)

: Dr. U.K. Bissa

Selection of studs

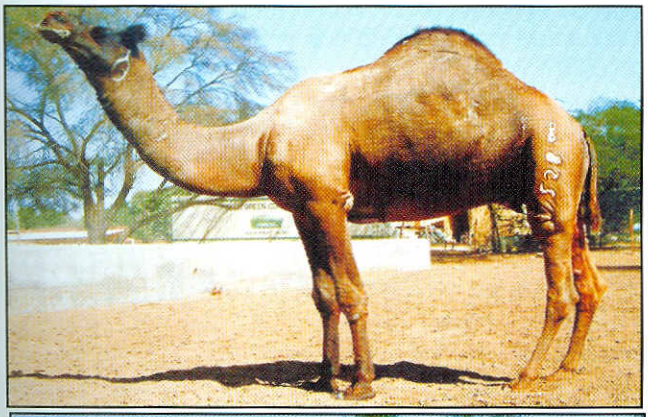
Body measurements of all breedable males of the Centre were recorded in November 2006. Based on the literature that body length and related traits have significant effect on draught ability, 5, 6 and 3 males, respectively of Bikaneri, Jaisalmeri and Kachchhi breed were selected mainly on the basis of body length (Table - 9) and following independent culling level for the other two traits. The number of available females has increased due to post partum breeding of females under reproduction experiment. The growth of the herd is thus expected to increase significantly.

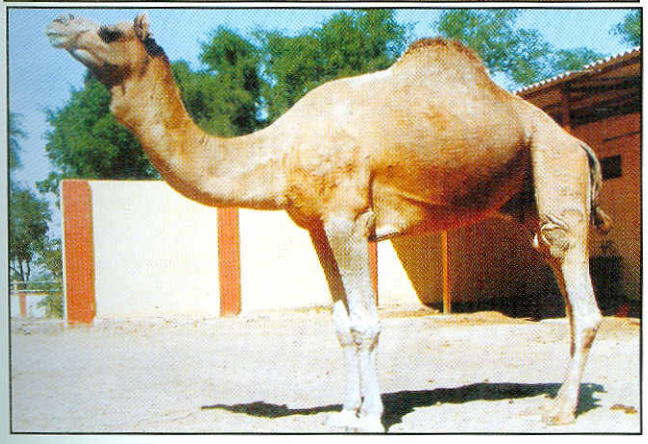
Table - 9: Population mean and selection differential in adult camels

(in cm)

Breed	Selection	N	Body Length	Heart Girth	Height at Wither
Over all	Selected	13	176.38	222.62	217.15
	Unselected	20	168.15	212.10	204.95
	Difference		8.23	10.53	12.2
	Significance	33	**	*	**
Bikaneri	Selected	5	175.00	222.40	218.60
	Unselected	3	153.33	197.00	201.33
	Difference		21.7	25.4	17.27
	Significance	8	**	NS	**
Jaisalmeri	Selected	6	180.17	222.00	215.50
	Unselected	15	170.80	215.20	206.53
	Difference		9.37	6.8	8.97
	Significance	21	**	NS	*
Kachchhi	Selected	2	168.50	225.00	218.50
	Unselected	2	170.50	211.50	198.50
	Difference		-2.00	13.50	20.00
	Significance	4	NS	NS	NS

*(P<0.05) **(P<0.01) ; NS - Non Significant





Project : Molecular genetic studies in Indian camel

Sub project : Microsatellite markers for genetic characterization of Bikaneri, Jaisalmeri and Kachchhi camel

Project Leader: Dr. S.C. Mehta

Nine samples of Kachchhi and thirteen samples of Jaisalmeri were collected from the breeding tract and included in the experiment. The entire data set was analyzed. So far 33 micro satellite primer pairs were procured and 28 were successfully amplified and analyzed. 18 were found polymorphic in Indian camel breeds. The number of alleles ranged from 2 to 7. The expected heterozygosity ranged from 0.289 to 0.816 and the polymorphic information content ranged from 0.267 to 0.791. Phylogenetic tree was constructed from the Nei's genetic distance matrix (GENDIST) using the UPGMA method of clustering by DRAWGRAM program of PHYLIP package. Cavalli Sforza Chord Distance was also calculated. One thousand bootstrapping were done and consensus trees were constructed and the same tree topology was derived with the three methods. Close phylogenetic relationship among the three indigenous camel breeds was observed (Table - 10 & 11).

Table - 10. Nei's Genetic Distance

Breeds	Bikaneri	Jaisalmeri	Kachchhi
Bikaneri	0.000000	0.100955	0.130955
Jaisalmeri	0.100955	0.000000	0.099101
Kachchhi	0.130955	0.099101	0.000000

Table - 11. Cavalli Sforza Chord Distance

Breeds	Bikaneri	Jaisalmeri	Kachchhi
Bikaneri	0.000000	0.074728	0.099726
Jaisalmeri	0.074728	0.000000	0.062229
Kachchhi	0.099726	0.062229	0.000000

Project : Molecular cloning, characterization and promoter analysis of the camel milk protein gene(s)

Project Leader : Dr. S. K. Bhure (up to 6.2.2006)
Dr. S. C. Mehta (from 7.2.2006)

Associates : Dr. Raghvendar Singh (up to 18.4.07)
Dr. M.S. Sahani (up to 31.8.06)

The α-lactalbumin and β-casein gene promoter fragments were amplified and characterised. The *E.coli*

JM 109 line was procured and the competent cells were prepared. The transformation reagents were prepared and the cells were transformed successfully. The respective promoter fragments were successfully cloned and the inserts were released and characterized. Sequencing of the cloned fragments was carried out. Two sequences have been deposited in the NCBI Gene Bank with accession numbers AM259943 (1799bp) and AM 259960 (812 bp).

Unit 2: Camel Physiology, Biochemistry and Reproduction

Programme : Improvement of reproductive efficiency and to study the causes of reproductive failures in camel

Project: Studies on artificial collection of semen from male camels, potential of camels to donate semen, reluctance to copulate in AV and investigations into reproductive hormone profiles between potent vs reluctant

Project Leader: Dr. Aminu Deen

A total of eight male camels were used for artificial collection of semen at regular intervals using AV method with a dummy female restrained in sitting posture during peak breeding season. The copulation time, volume of semen ejaculated and vigorosity of copulation reaction were recorded. Effects of month of collection and animals on these traits were evaluated. Hormone profiles of Testosterone and Estradiol once in a month at 1 hr intervals for 24 hours was carried out using RIA. Hormone profiles of camels reluctant to donate semen were compared with those, which were ever anxious for sexual courtship in AV to find out possible association between reluctance to serve and endocrine profiles.

Copulation time and volume of semen ejaculate under artificial collection in camels

Regular satisfactory copulations in AV were observed in six of the eight male camels, while remaining two camels were reluctant to copulate in AV. Table - 12 shows month wise, animal wise and overall copulation time and volume of semen ejaculated from six male camels over six months of study. The average copulation time and volume of semen ejaculated were measured as 295.73 ± 11.82 seconds and 2.85 ± 0.21 ml, respectively in 176 attempts to collect semen over six months period. Mean copulation time within animals did not differ significantly over different months on each of six months tested. Mean copulation time between animals differ significantly ($P<0.01$). Analysis revealed that mean copulation time(s) were significantly different ($P<0.01$) between different animals for the months of January, February, April and May, while no significant differences were observed for December and March months. Effect of months within individual males on volume of semen ejaculated had variable effect, while no significant difference was observed in 5/6 males on month basis, it was significantly different ($P<0.01$) in remaining one animal. Analysis revealed significant differences ($P<0.01$) between animals for volume of semen ejaculated during February, while for rest of the five months difference was not significant. Month wise overall copulation time and volume of semen measured 216.8 ± 22.74 seconds, 1.7 ± 0.29 ml; 272.51 ± 20.9 seconds, 2.13 ± 0.29 ml; 300.13 ± 22.86 seconds, 2.5 ± 0.28 ml; 395.95 ± 42.42 seconds, 4.76 ± 0.98 ml; 320.32 ± 30.71 seconds, 3.78 ± 0.66 ml; 245.85 ± 31.41 seconds, 2.76 ± 0.30 ml, respectively for December, January, February, March, April and May months. Animal wise mean copulation time and volume of semen ejaculated measured 205.5 ± 16.93, 2.05 ± 0.26 ml; 310.70 ± 24.03, 2.54 ± 0.24 ml; 393.73 ± 25.84, 4.22 ± 0.73 ml; 418.33 ± 29.77, 4.68 ± 0.63 ml; 147.83 ± 17.74 seconds, 1.32 ± 0.19 ml; 238.15 ± 15.18 seconds, 1.74 ± 0.21 ml, respectively in six animals over the entire six months.

Testosterone profiles

Month wise testosterone (T) profiles of six male camels have been presented in Table - 13. Average maximum T profiles were recorded during February and January months, which were significantly greater ($P<0.01$) from those recorded during December, March and April months when the T profiles were moderately high and both of these (Jan-Feb and Dec-Mar-Apr) were significantly higher than those recorded during May and June. These data indicate that endocrine surge of testosterone is at peak during January and February. It starts declining subsequently and reaches basal levels during June month. Individual variations were observed in duration of endocrine surge. Cessation of endocrine surge was evident during March month in 1/6, in April in another 2/6 and in May month in remaining 3/6 animals. Graphic presentation of average month wise circulating testosterone profiles follows in Fig.-1.

Table - 12: Month wise, animal wise and overall copulation time and volume of semen ejaculated for six months study

Animal No.	DECEMBER			JANUARY			FEBRUARY			MARCH			APRIL			MAY		
	N	CT	V	N	CT	V	N	CT	V	N	CT	V	N	CT	V	N	CT	V
1 (112)	3	177.66 ± 58.76	1.33 ± 0.81	7	219.42 ± 44.88	1.9 ± 0.20	7	200 ± 45.21	2 ± 0.47	2	238.5 ± 106.77	2.75 ± 1.06	5	213.8 ± 63.8	1.65 ± 0.95	3	209 ± 58.94	3.66 ± 0.81
2 (214)	4	274.75 ± 72.73	1.87 ± 0.43	7	292 ± 36.83	2.14 ± 0.30	7	225 ± 58.07	1.91 ± 0.47	5	376.6 ± 102.89	3.1 ± 1.12	6	361.66 ± 30.24	3.66 ± 0.44	2	425.5 ± 6.36	3 ± 0
3 (224)	4	248.5 ± 46.7	3 ± 0	8	348.25 ± 63.53	3.4 ± 1.12	7	434.85 ± 35.17	4.14 ± 0.73	5	437 ± 75.58	6.4 ± 3.21	6	507.16 ± 75.48	3.41 ± 0.49	3	307.66 ± 51.46	3.16 ± 0.54
4 (120)	3	253.33 ± 94.76	3.66 ± 1.08	7	364.14 ± 48.09	3.5 ± 0.61	8	451.75 ± 36.78	4 ± 0.83	4	611.25 ± 98.43	8.75 ± 2.80	7	404.42 ± 75.30	5.64 ± 1.73	1	372 ± 0	2.5 ± 0
5 (128)	3	109 ± 38.89	1.33 ± 0.54	6	138.16 ± 31.75	1.7 ± 0.45	4	260.25 ± 47.32	2.25 ± 0.50	3	219 ± 40.37	1.5 ± 0.35	6	126.83 ± 29.14	1.7 ± 0.62	2	116.5 ± 19.09	1.5 ± 0
6 (218)	3	205.66 ± 20.91	1.75 ± 1.06	6	237 ± 34.18	1.87 ± 0.59	8	242.71 ± 23.09	2.14 ± 0.25	2	333 ± 69.29	3.75 ± 0.35	5	262.4 ± 48.54	1.9 ± 0.41	3	158.6 ± 46.18	1.66 ± 0.81
overall	20	216.8 ± 22.74	1.7 ± 0.29	41	272.51 ± 20.90	2.13 ± 0.29	41	300.13 ± 22.86	2.5 ± 0.28	24	395.95 ± 42.42	4.76 ± 0.98	35	320.32 ± 30.71	3.78 ± 0.66	14	245.85 ± 31.41	2.76 ± 0.30

N No. of attempts; CT Copulation time; V - Volume

Table - 13: Month wise Testosterone (pg/ml of plasma) profiles of six male camels monitored at hourly intervals for round the clock (24 hrs.) once in a month

Animal	December	January	February	March	April	May	June
1 (128)	14003.68±^{a} 942.37	23619.12±^{b} 977.31	18794.09±^{c} 2030.56	1660.66±^{d} 212.55	1614.47±^{d} 238.66	2259.97±^{d} 343.83	954.78±^{e} 105.73
2 (112)	5963.56±^{a} 285.42	19618.96±^{b} 1105.48	20474.60±^{b} 2030.39	9364.84±^{c} 1027.20	15403.00±^{b} 2289	1521.35±^{d} 254.77	538.70±^{e} 65.46
3 (218)	7045.2±^{a} 478.74	31684.91±^{b} 1463.88	21540.48±^{c} 1983.28	8112.37±^{a} 1152.46	1757.85±^{d} 277.75	1665.86±^{d} 455.85	622.77±^{e} 62.69
4 (214)	5975.30±^{a} 279.48	30340.41±^{b} 1433.61	22845.04±^{c} 1727.46	18294.52±^{c} 3076.28	17005.33±^{c} 2834.97	1967.77±^{d} 198.70	717.16±^{e} 120.50
5 (230)	14807.56±^{a} 1061.15	24030.80±^{b} 1938.16	22281.56±^{b} 2137.08	9273.48±^{c} 838.30	4898.97±^{d} 789.82	3430.45±^{d} 438.69	1110.36±^{e} 126.99
6 (232)	8891.26±^{a} 848.36	4099.16±^{c} 249.07	37097.83±^{a,b} 11411.40	18869.72±^{b} 2219.72	11466.17±^{a,b} 1735.98	2180.14±^{d} 312.12	1576.43±^{d} 189.23
Overall	9618.83±^{a} 431.78	22174.81±^{b} 929.38	23750.70±^{b} 2201.25	10919.09±^{a} 886.34	8573.46±^{a} 879.03	2201.38±^{c} 151.61	910.76±^{d} 57.06

Row wise values with same superscripts did not differ significantly while values with different superscript differ significantly (P<0.01)

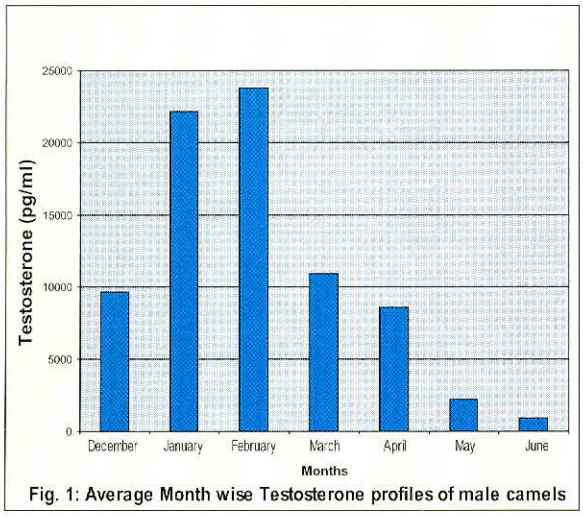


Fig. 1: Average Month wise Testosterone profiles of male camels

Estradiol profiles

Month wise estradiol profiles of 6 male camels have been presented in Table - 14. One-way analysis of variance revealed monthly statistically significant ($P<0.01$) differences in circulating estradiol concentration. The circulating concentration was the lowest in the month of December, which increased slowly in the month of January, peaked during February and March followed by decline during April and May month. The circulating concentration showed an increase again during the month of June. These data indicated that sexual activity is also correlated with endocrine surge of estradiol in male camel. Graphical presentation of estradiol profile can be observed in Fig.-2.

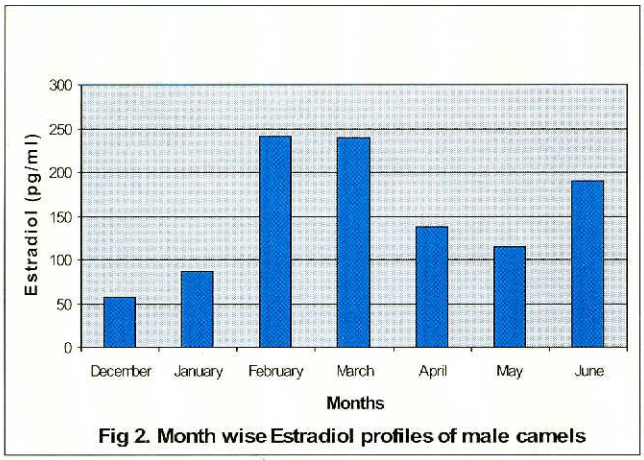


Fig 2. Month wise Estradiol profiles of male camels

Table - 14. Month wise estradiol (pg/ml) profile of six male camels monitored at hourly intervals round the clock (24 hours) once in a month

Animals	December	January	February
1 (128)	57.73± 1.55	84.14±5.31	167.77±29.85
2 (112)	41.15± 5.20	100.99±4.96	161.04±6.03
3 (218)	48.49± 2.65	101.67±4.59	207.62±11.83
4 (214)	71.48±2.98	70.66±6.13	281.39±25.19
5 (230)	81.14± 3.35	107.84±5.49	214.32±9.67
6 (232)	41.70±5.09	54.83±5.33	423.26±43.06
Overall	**57.05±1.91**	**86.69±2.69**	**241.31±12.27**

Animals	March	April	May	June
1 (128)	161.53±32.03	181.25±26.08	80.82±31.61	62.61±17.12
2 (112)	211.7± 47.15	82.61±26.47	77.32±11.59	56.96±18.39
3 (218)	204.77±31.98	105.88±51.57	129.83±88.13	449.38±210.22
4 (214)	374.4±145.06	197.24±54.00	196.20±112.10	182.78±84.02
5 (230)	251.62±52.46	145.85±24.94	135.47±18.82	265.71±187.63
6 (232)	210.23±82.59	111.89±23.85	65.98±15.20	126.13±21.74
Overall	**238.93±29.21**	**137.45±14.98**	**114.27±22.04**	**190.59±49.21**

Month wise differences are statistically significant ($P<0.01$)

Month wise T profiles of four potent male camels cumulative and one psychic impotent male have been presented in Table - 15 and Fig. - 3. The profiles showed that T profiles were significantly high in psychic impotent ($P<0.01$) animal during December, May and June months, while for remaining four months of January- April, the difference was not significant. These results indicated that impotence was not due to deficiency of Testosterone hormone but due to other reasons apparently psychic inhibition to copulate in presence of persons.

Table - 15: Month wise testosterone profiles (pg/ml of plasma) of four potent and one psychic impotent male

Months	4 potent males	1 psychic male
December	8403.95 ± 460.96	14807.56 ±1061.15*
January	26125.01 ± 821.99	24030.80 ±1938.16
February	20683.26 ±1021.05	22281.56 ±2137.08
March	9386.52 ±1107.55	9273.48 ±838.30
April	8863.15 ±1208.94	4898.97 ±789.82
May	1900.80 ±173.28	3430.45 ±436.69*
June	698.76 ±48.98	1110.36 ±126.99*

* Significantly different (P<0.01)

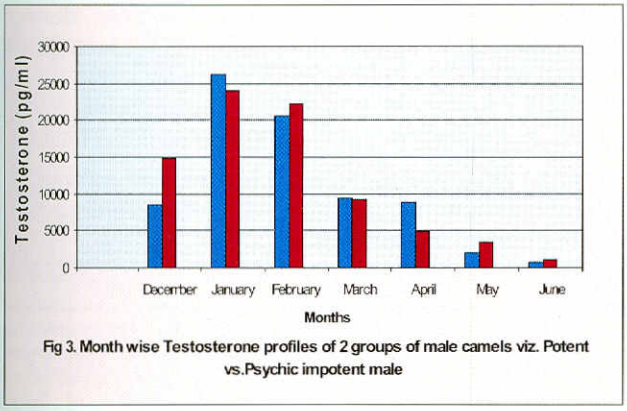


Fig 3. Month wise Testosterone profiles of 2 groups of male camels viz. Potent vs.Psychic impotent male

Month wise estradiol profiles of four potent male camels and one psychic impotent male camel have been presented in Table - 16 and Fig. - 4. One-way analysis of variance indicated that estradiol concentration of psychic impotent male was significantly (P<0.01) greater during December and January months from group of four potent males, while for remaining months of February-June, the circulating concentration of estradiol did not differ significantly.

Month wise T profiles of potent male camels and one less potent male have been presented in Table - 17 and Fig. - 5. The T profiles during January month were significantly higher in potent males (P<0.01), while T profiles during February, March and June months were significantly high in less potent male (P<0.01) as compared to potent males. For remaining three months the differences were non-significant. Late arousal and little experience appear to be the possible reasons for low potency in this particular male.

Table - 16. Month wise estradiol profiles (pg/ml) of potent male camels and 1 psychic impotent male camel

Months	Four potent male camels	One psychic impotent male camel
December	54.71± 2.003	81.14±3.42*
January	89.37± 2.883	107.84±5.59*
February	203.37±11.10	214.32±9.85
March	243.20±41.05	251.62±52.46
April	141.74±21.50	111.89±23.85
May	121.04±32.57	135.47±18.82
June	187.93±63.40	56.96±18.39

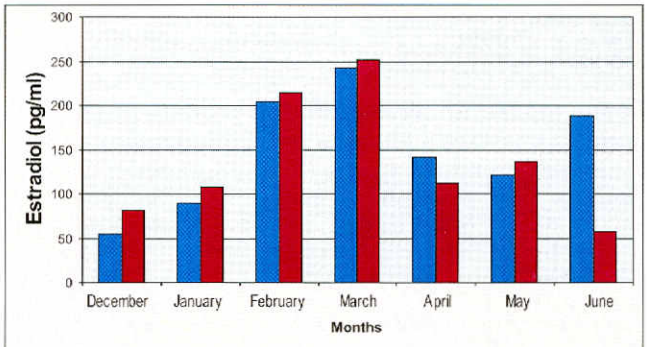


Fig 4. Month wise estradiol profiles of 2 groups of camels viz. potent and psychic impotent male camel

Table - 17: Month wise testosterone profiles (pg/ml of plasma) of four potent and one less potent male

Months	Four potent males	One less potent male
December	8403.95 ± 460.96	8891.26±848.36
January	26125.01 ± 821.99	4184.86±262.17
February	20683.26 ±1021.05	37689.91±12464.37*
March	9386.52 ±1107.55	18838.09±2381.76*
April	8863.15 ±1208.94	11678.76±1858.48
May	1900.80 ±173.28	2068.97±263.37
June	698.76 ±48.98	1560.23±196.92*

* Significantly different (P<0.01)

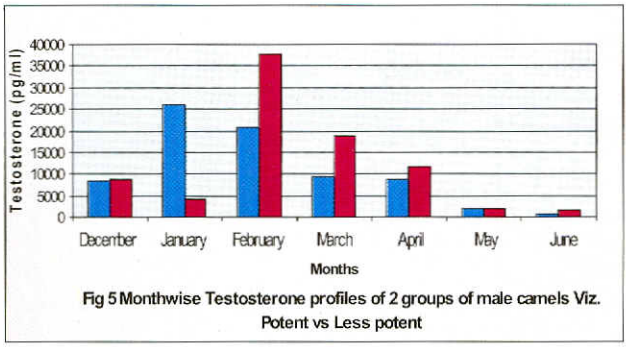


Fig 5 Monthwise Testosterone profiles of 2 groups of male camels Viz. Potent vs Less potent

Month wise estradiol profiles of four potent male camels and one less potent male camel have been presented in Table - 18 and Fig. - 6. Estradiol concentration was significantly greater ($P<0.01$) during December and January months in four potent males while reversed in favour of less potent male for ensuing February month. For remaining 4 months, the concentration did not differ significantly.

Table - 18: Month wise Estradiol profiles (pg/ml) of potent male camels and one less potent male camel

Months	Four potent male camels	One less potent male camel
December	54.71± 2.003*	41.70±5.18
January	89.37± 2.883*	54.83±5.43
February	203.37±11.10	423.26±44.80*
March	243.20±41.05	210.23±82.59
April	141.74±21.50	145.85±24.94
May	121.04±32.57	65.98±15.20
June	187.93±63.40	126.13±21.74

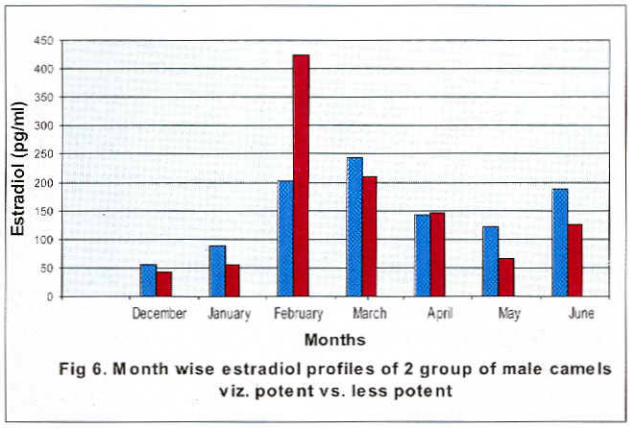


Fig 6. Month wise estradiol profiles of 2 group of male camels viz. potent vs. less potent

Of the two males, which were reluctant to copulate in AV, one male remained absolutely reluctant. Analysis of plasma testosterone revealed that levels of this hormone were not deficient in this particular animal. It was also observed that this particular male tend to cover females when let loose in the shed along with female camels. These observations are indicative of psychic inhibition in this particular animal that it shows reluctance to copulate in presence of persons.

Semen collection performance of another reluctant animal in terms of number of attempts, copulation time and volume of semen ejaculated over different months has been presented in Table - 19. This particular animal was also reluctant to copulate during initial months but later on it copulated and donated semen at least on few occasions but not regularly. Regarding peripheral testosterone concentration in this particular animal, it was significantly low during December and January months, but it increased tremendously during February. These observations are indicative of delayed endocrine surge coupled with psychic inhibition for the poor performance of the animal.

Table : 19. Month wise copulation time and volume of semen ejaculated in relation to less potent camel over the period of six months

Animal No.	December				January			
	N	R	CT	V	N	R	CT	V
7	2	0	93 ± 63.22	0	5	3	79.33 ± 58.02	1.1 ± 1.2
8	3	0	0	0	5	0	0	0

Animal No.	February				March			
	N	R	CT	V	N	R	CT	V
7	5	3	133.33 ± 71.34	1.75 ± 1.06	2	0	97.5 ± 60.10	2 ± 0
8	4	0	0	0	1	0	0	0

Animal No.	April				May			
	N	R	CT	V	N	R	CT	V
7	7	2	129 ± 46.83	3.2 ± 1.92	3	1	30 ± 14.14	0
8	2	0	0	0	2	0	0	0

N No. of attempts
R No. of refusals
CT Copulation time
V Volume of semen

Properties of semen

It was observed that camel semen has unique properties. On centrifugation of semen samples a clear watery and transparent to semi-transparent liquid supernatant can be separated form semen samples in varying quantities with a trend to have little volume with thick and low volume of semen and relatively high volume in thin and voluminous semen samples. The sperm pellet left after separation use to be very sticky, thread like gel in appearance, remain non miscible with physiological buffers and it does not liquefy on storage at refrigerator temperature. Spermatozoa remain protected in sperm depot and viability can be sustained for several weeks to even a month. Evacuation of spermatozoa from sperm depot can be demonstrated under microscope.

Semen sample after centrifugation with clear supernatant and settled sperm pellet

Thread like gelationous sperm pellet

Sperm pellet remains non-miscible

Project : Investigations into follicular activity of female camel through recto-genital palpation and estradiol hormone profiles of unmated female camels

Project Leader: Dr. Aminu Deen

Recto-genital palpation of female camels were regularly conducted to derive palpation characteristics of their ovaries such as size, shape, presence of follicles in a group of 10 female camels and conducted a small pilot trial of 10 days to monitor their estradiol concentration to find out association between ovarian characteristic and estradiol profiles. Based on the results of this pilot trial, a long-term daily monitoring of estradiol was carried out in unmated female camels to find out the nature of follicular activity in unmated female camels.

Recto-genital palpation of ovaries of female camels revealed that ovary may appear as 1) thin flattened sheets, 2) or sometime in the form of small sized, slightly bulging structure, 3) 8 knot shaped with or without fluid filled structure, 4) round thick walled ball larger than Table - tennis ball, 5) as slightly longer sheet with pearl like blistering follicles on it, 6) oval in shape, with tense fluid filled structure, 7) ovaries bearing spherical fluid filled structure, more than one and each of them are distinct and separate from each other.

A pilot trial of monitoring estradiol profiles for 10 days in 2 types of female camels viz. bearing a definite follicle in the ovary and non- follicular status. The results showed that difference was not significant for distinguishing 2 groups. These results indicated that basal levels of this hormone even in non-follicular ovary is higher than in cattle, sheep and goat. It is expected that growth of follicles should be reflected in peripheral concentration of estradiol, another experiment was accomplished, in which daily estradiol profiles were monitored for a period of around 60 days.

The profiles have been presented in Fig. - 7a-e and Table - 20, which shows that peak levels of estradiol in unmated female camels were observed at irregular intervals, peak persisted for 1, 1-2, 1-3 or in some cases at 1-8 days.

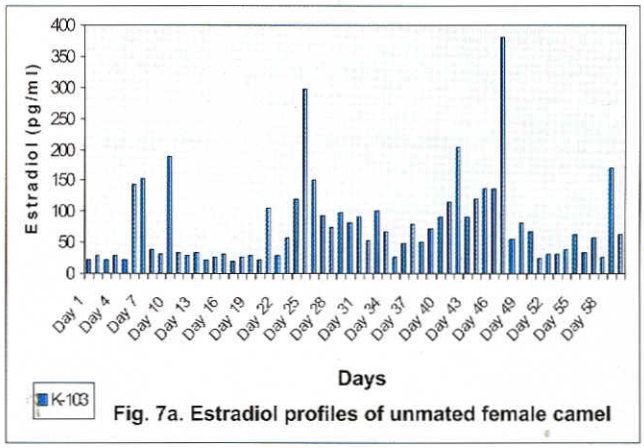


Fig. 7a. Estradiol profiles of unmated female camel

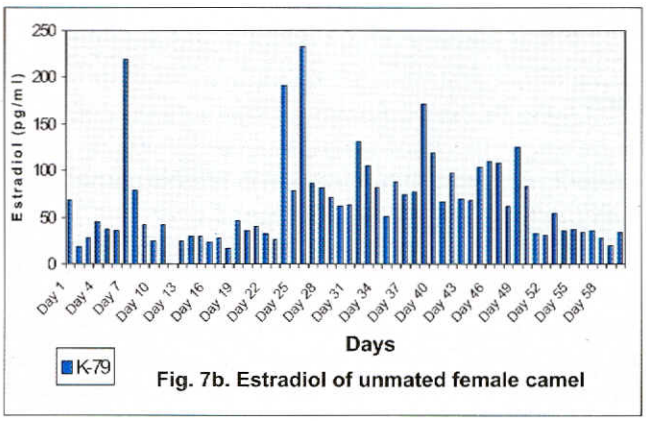


Fig. 7b. Estradiol of unmated female camel

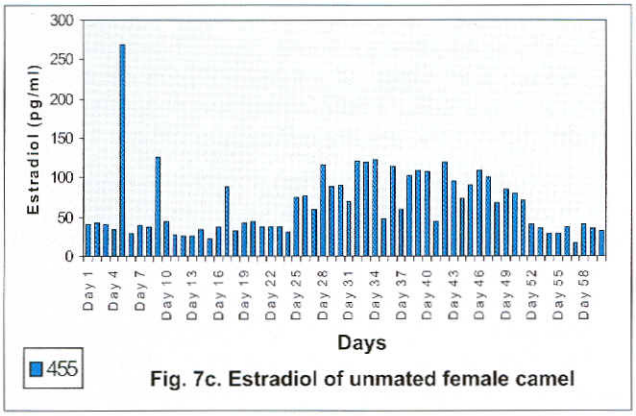


Fig. 7c. Estradiol of unmated female camel

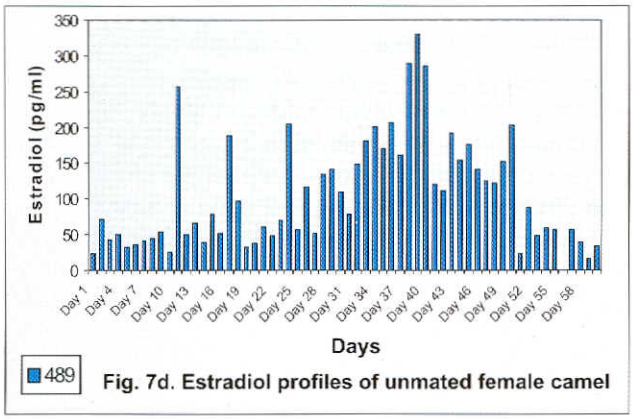


Fig. 7d. Estradiol profiles of unmated female camel

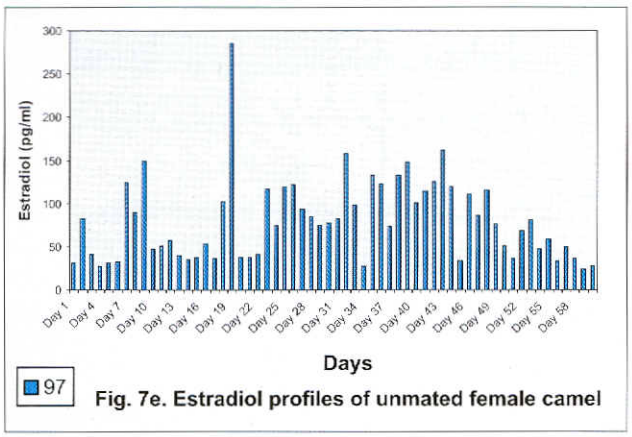


Fig. 7e. Estradiol profiles of unmated female camel

Project : Artificial insemination in female camel

Project Leader: Dr. Aminu Deen

An experiment on artificial insemination of female camels was conducted, initially by detection of follicles through recto-genital palpation in xylazine sedated female camels, followed by administration of hCG and deposition of neat semen 24 hr after exogenous administration of hCG. Through traditional method of pregnancy diagnosis, it was observed that only 3 of the 10 females are apparently pregnant out of 10 animals with attempted number of inseminations 13. Though it was not clear, whether xylazine sedation can affect the impregnation, but looking to the role of catecholamines in reflex ovulation, it was decided to carry out insemination without xylazine sedation and exogenous hormone. Only semen is being deposited into the uterus of female camels after restraining them in a sitting posture. This pilot study is under progress.

Project : Development of RIA facilities for reproductive hormones

Project Leader : Dr. Aminu Deen

Anti-ovine LH serum and Anti Rabbit gamma globulin were tested through immuno-diffusion test to develop assay for cameline LH (Figs 8 and 9).

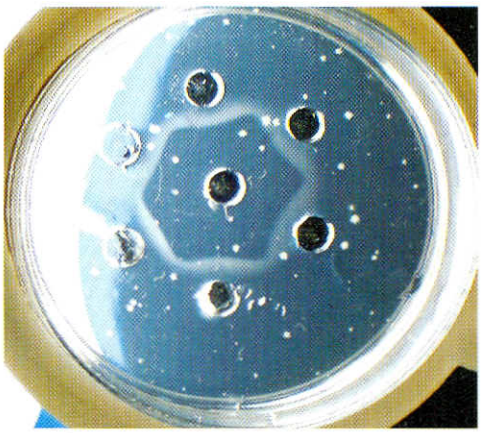


Fig. 8. Precipitation band of ovine LH and anti-ovine LH sera raised at the institute

Fig. 9. Precipitation band of rabbit gamma globulin and anti rabbit gamma globulin raised at the institute

Table - 20. Mean ± S.E., Range, S.D., No. of points above mean ± S.D., inter peak intervals and persistence of peak levels of Estradiol in unmated female camels

Animal No.	Mean ± S.E(pg/ml)	Range	S.D.	Mean ± S.D.	No. of points above Mean ± S.D.	Inter peak intervals	Duration of persistence of peak levels
97	81.16±6.21	23.88-285.6	47.73	128.89	6	1-13 days (9,13,3,1,3)	1-2 days
489	104.93±9.94	0.84- 330.5	76.35	181.28	6	2-10 days (5,6,10,2,4)	1-8 days
455	65.29±5.47	16.4- 269.0	42.04	107.3	8	1-18 days (3,18,3,1,2,1,3)	1-3 days
79	66.62±6.21	17.32- 232.7	42.73	114.35	6	1-16 days (16,1,6,6,8)	1-2 days
103	77.79±8.85	20.48- 380.1	67.79	145.78	6	2-15 days (2,14,15,4,11)	1-2 days

Project: Isolation and characterization of major proteins in camel semen

Project Leader : Dr. Gorakh Mal

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

Total protein (g/dl) was estimated in the seminal plasma of six camels. A wide variation in the total protein concentrations was observed (Table - 21). Total protein content in the fresh seminal plasma and plasma samples taken out at different time intervals were estimated. Total protein in the seminal plasma remains almost stable up to 124h (Fig. - 10). Seminal plasma protein patterns in Jaisalmeri camels were analyzed by SDS-PAGE under non-reducing conditions. Seminal plasma samples showed 7-8 bands with different intensities. Repeated experiments showed a unique band with very strong intensity in one particular camel. This study shows 2-4 major protein components in the seminal plasma of Jaisalmeri camels and seminal plasma protein profiles vary from animal to animal (Fig. - 11). Contrary to the free spermatozoa in semen ejaculate of cattle and buffalo, freshly ejaculated camel spermatozoa are entrapped in a sort of gelatinous mass resembles to those of human semen ejaculates. Experiments carried out to study the changes in protein profiles at different time intervals indicated that in fresh semen ejaculates; higher molecular weight proteins are present which remains up to 18h (Fig. - 12, 13 and 14) and after that these proteins start to degrade as the camel semen starts to liquefy. This might be due to proteolytic cleavage of the coagulating proteins.

Table - 21: Total proteins in seminal plasma (g/dl) of six camels

Camel No.	No. of samples	Mean±S.E (g/dl)	Range (g/dl)
112	6	4.01±0.15	3.58-4.39
224	7	3.69±0.11	3.31-3.97
214	6	3.36±0.17	2.97-3.70
120	6	1.45±0.04	1.30-1.56
128	6	1.26±0.37	0.49-2.58
218	8	0.88±0.03	0.76-1.06

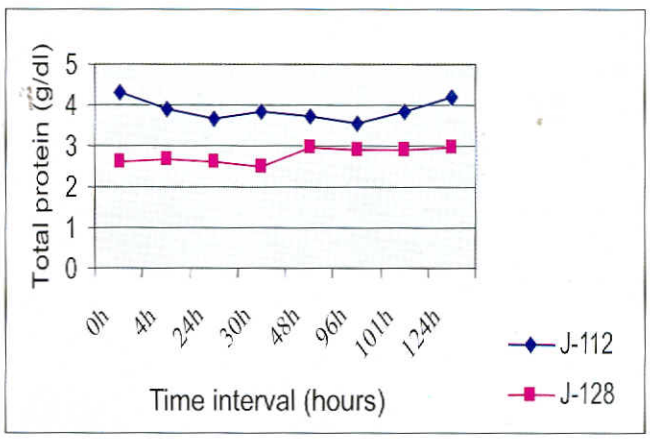


Figure 10: Changes in seminal plasma total protein (g/dl) at different time intervals

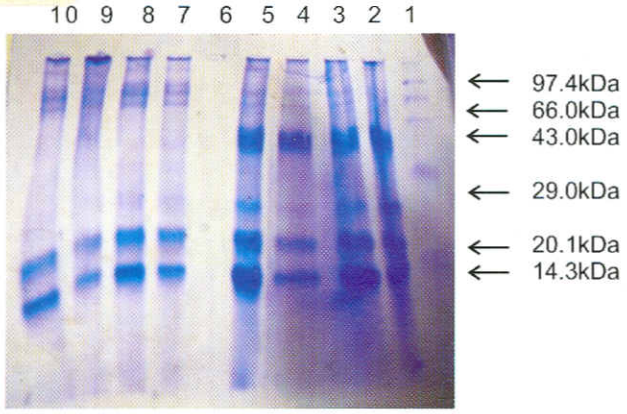


Figure 11: Seminal plasma samples run on 15% gel. Lane-1, Marker; Lanes 2 -5 and 7-10 having samples of J-112 and J-224 respectively. Lane-6, -ve control. Lanes 2 and 7 having fresh plasma samples; lanes 3 and 8 having fresh plasma samples with equal volume of 4% SDS. Lanes 4 and 9 having plasma sample taken after 18 hours; lanes 5 and 10 having plasma samples taken after 18 hours with equal volume of 4% SDS.

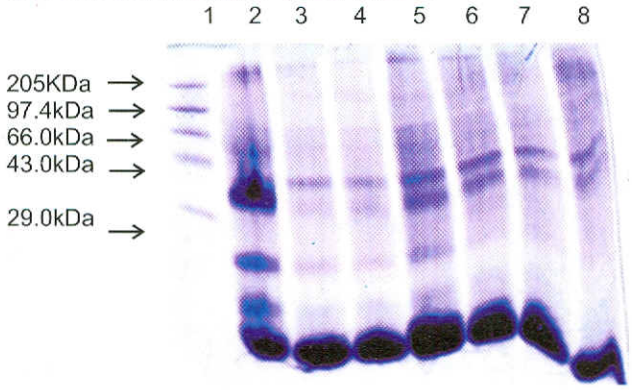


Figure 12: Seminal fluid samples of J-214. Lane-1 Marker; Lane 2 (18h+4%SDS); Lane 3 (23h+4%SDS); Lane 4 (41h+4% SDS); Lane 5 (47h+4%SDS); Lane 6 (53h+4%SDS); Lane 7 (64h+4% SDS) and Lane 8 (70h+4%SDS)

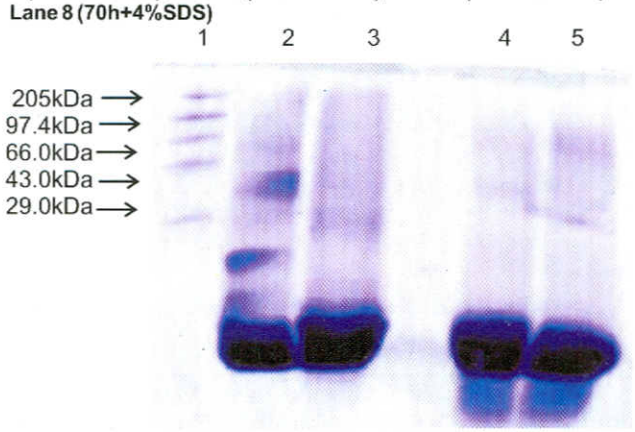


Figure 13: Seminal fluid samples of J-128 Lane 1, Marker; Lane 2 (18h); Lane 3 (23h); Lane 4 (47h) and Lane 5 (64h).

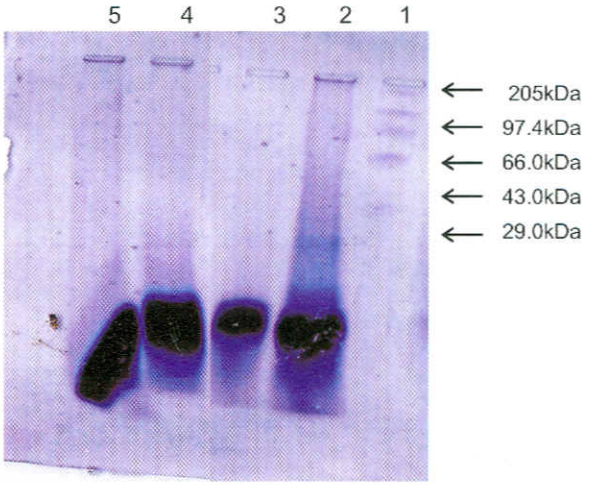


Figure 14: Seminal fluid samples of J-224. Lane-1 Marker; Lane- 2 (18h); Lane-3 (64h); Lane-4(136h) and Lane-5 (142h)

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

Project Leader : Dr. Ashwani Kumar Roy
Associates : Dr. Ashok Kumar Nagpal
: Dr. G. S. Tiwari

Objectives of the project

(a) Long term objective

Efficient utilization of drought energy without causing any health hazard to the camels

(b) Short term objectives

1. To measure the growth and drought performance of camels at different age groups.
2. Comparison of draught output among male and female camels under field conditions.
3. To study the physiological behavior and biochemical changes in the blood taking place during draught ability studies at different levels.
4. To study the seasonal effect on work performance and test the endurance of camels with different levels of draught.
5. To formulate work rest cycles for camels in different seasons for getting optimum work

Status: The project was prepared after the review of relevant literature and the information collected from N.D.R.I. Karnal and C.T.A.E. Udaipur. The project proposal for the said project has been finalized in consultation with Dr G.S. Tiwari after his visit to N.R.C.C. Bikaner and submitted for approval by the SRC. The research work for the first phase is expected to start during the current summer season.

Project : Evaluation of camel milk proteins and their applications

Project Leader : Dr. Raghvender Singh

Associates : Dr. S.K.Ghorui

: Dr. G .Nagarajan

Milk of three different phases of lactations viz. colostral period, early lactation (3-4 weeks) and late lactation (prior to dry period) was collected from six female camels. Fat-free milk samples were subjected to fractionation using membrane filters having different cut off values-100, 60,30 and 10 Kda. Analysis of the different fractions of proteins was done by gradient PAGE (5-20% gel) (Fig. - 15). Isolation of lactoferrin (Fig. - 16) was carried out through CM-Sephadex column, washed with 0.1 to 0.5 M NaCl in 0.01M Tris-HCl buffer (pH 8.0) and eluted with 0.1M NaCl and its analysis was carried out in 12% SDS-PAGE

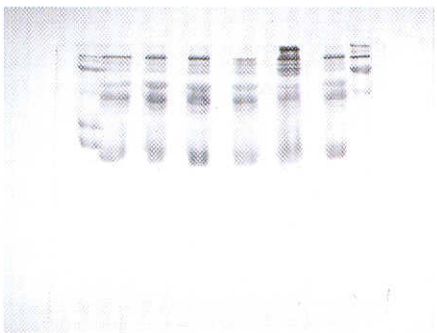


Fig. 15 : Gradient PAGE for different fractions of camel milk proteins

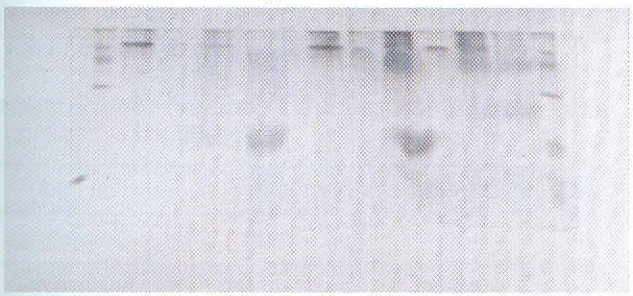


Fig. 16: Isolation of lactoferrin from camel milk

Unit : Camel Health

Programme : Surveillance, monitoring and control of camel diseases

Project : Comparative studies on the sensitivity of polymerase chain reaction (PCR) and serological tests for diagnosis of camel trypanosomosis

Project leader : Dr. S.K. Ghorui

Associates : Dr. R. Singh

: Dr. G. Nagarajan

A new set of primer was used for 57 known positive samples from camels. DNA amplification yielded a single amplicon of 540 bp in all the samples (Fig.- 17). The analytical sensitivity for this primer ranged between 10-100 pg. Screening of 33 suspected field samples from camels using this primer revealed that all were negative for trypanosoma infection.

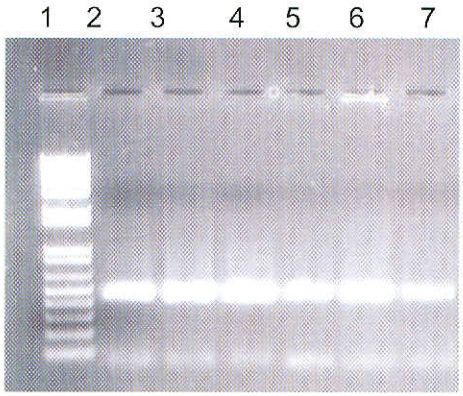


Fig. 17. DNA amplification with a new set of primer showing amplicon of 540 bp (Lane 1 marker, lane 2 to 7 samples)

Project : Treatment of intra mammary infections in camels by ascorbic acid

Project Leader : Dr. F.C. Tuteja

Associate : Dr. S.K. Dixit

Aseptically collected milk samples from 60-quarters of 15 lactating camels were subjected to bacteriological culture to identify infected quarters. 20 out of 60 quarters were found infected. These camels were divided into 2 groups. Group I comprised of 9 animals with 13 infected quarters, they were given ascorbic acid @ 50 gm once orally, while Group II comprised of 6 animals with 7 infected quarters to serve as untreated control. After 72 hours of treatment, milk samples from these animals were collected again for bacteriological culture to evaluate the effect of ascorbic acid therapy. The results are presented in Table - 22. The overall efficacy of treatment was 46.1% with ascorbic acid as compared to none in control group.

Table - 22: Treatment efficacy of ascorbic acid against intra mammary infections

Organism	Ascorbic acid		Untreated control	
	Quarters infected		Quarters infected	
	Before treatment	After treatment	Before treatment	After treatment
Staphylococcus spp	9	5	5	5
Micrococcus spp	2	1	0	0
Streptococcus spp	1	0	1	1
Corynebacterium spp	1	1	1	1
Overall	13	7	7	7
Percent clearance of infections	46.1%		0%	

Project : Immunity aspects in neonatal camel calves

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

Associates : Dr. Gorakh Mal

: Dr. S. K. Dixit

Ten camel calves were selected at 5-6 months of age and divided into two groups of 5 each. The Group I calves were fed with an herbal immunomodulator (Trade name: RESTOBAL) @ 25ml per day orally for 7 days. Group II camel calves served as control group. Both the groups were maintained under identical feeding practices. Blood samples were collected on different days before the start of experiment (day 0), on day 4 (while supplementing) and on days 8, 15 and 21 after the supplementation with immunomodulator for immunoglobulin and protein profiles. The body weight changes prior to and after the completion of experiment were recorded.

Mean Ig, total protein, globulin concentration and body weight in the two groups are presented in Table - 23 to 27.

Table - 23: Mean Ig concentration in camel calves

S. No.	Duration	Immunoglobulin concentration (mg/ml)	
		Group I	Group II
1.	Day 0	17.058+0.661	17.232+0.676
2.	Day 4	17.496+0.619	17.414+0.518
3.	Day 8	17.514+0.605	17.452+0.463
4.	Day 15	17.764+0.627	17.584+0.504
5.	Day 21	18.058+0.703	17.652+0.504

Table - 24: Mean total protein concentration in camel calves

S. No.	Duration	Total protein concentration (g/dl)	
		Group I	Group II
1.	Day 0	5.942+0.172	5.630+0.189
2.	Day 4	5.772+0.196	5.554+0.124
3.	Day 8	5.804+0.179	5.600+0.135
4.	Day 15	5.960+0.191	5.612+0.046
5.	Day 21	6.184+0.166	5.528+0.119

Table - 25: Mean albumin concentration in camel calves

S. No.	Duration	Albumin concentration (g/dl)	
		Group I	Group II
1.	Day 0	3.260+0.167	3.076+0.158
2.	Day 4	3.046+0.073	3.018+0.071
3.	Day 8	3.078+0.044	3.026+0.051
4.	Day 15	3.112+0.040	3.094+0.070
5.	Day 21	3.160+0.027	3.018+0.069

Table - 26: Mean globulin concentration in camel calves

S. No.	Duration	Globulin concentration (g/dl)	
		Group I	Group II
1.	Day 0	2.682+0.128	2.554+0.179
2.	Day 4	2.726+0.152	2.536+0.086
3.	Day 8	2.694+0.160	2.574+0.105
4.	Day 15	2.848+0.186	2.518+0.071
5.	Day 21	3.024+0.162	2.510+0.159

Table - 27: Body weight (kg) in different groups before and after

(Mean+SEM)

S. No.	Animal No.	Body weight (kg)	
		Day 0	Day 21
Group I			
1.	65	147	149
2.	336	156	157
3.	359	114	113
4.	451	113	113
5.	505	162	166
Mean+SEM		138.4+10.4	139.6+11.1
Group II			
1.	389	156	154
2.	393	151	152
3.	509	90	92
4.	471	133	130
5.	115	159	156
Mean+SEM		137.8+12.7	136.8+12.1

Project : Raising of polyclonal antisera in sheep against camel

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

Associates : Dr. Gorakh Mal

: Dr. S. K. Dixit

Immunoglobulins

Raising of antisera in sheep against camel serum immunoglobulin. The raised antisera was checked for its crossreactivity using double immuno diffusion. Camel serum showed crossreactivity with the antisera raised in sheep (Fig. 18). The appearance of precipition lines at the zone of equivalence depicts the cross reactivity between camel Ig's and sheep anti-camel Ig's.

Project : Indigenous System of medicine against skin affections mange in dromedary camel

Project Leader : Dr. S.K. Dixit

Associate : Dr. F.C. Tuteja

: Dr. (Mrs) D. Suchitra Sena

Two herbal formulations were developed using commonly available ingredients at farmer's door. The formulations were evaluated for their efficacy against sarcoptic mange. Formulation F_I was found reasonably effective against this dreadly disease of camel. Formulation F_{II} also had equal coverage against mange with additional qualities, of course that need some more trials for evaluation. Both formulations relieved the animals from symptoms viz. intense itching, thickening and wrinkling of skin, excoriation etc. apart from conditioning, nourishing and toning the skin.

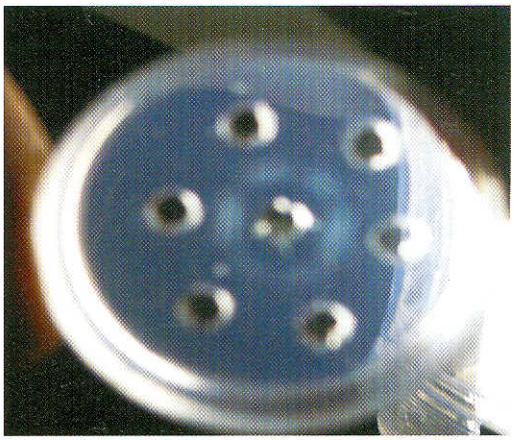


Fig 18. Double immune diffusion test central well : sheep, anti camel immunoglobulin, surrounding with camel serum

Project : Therapeutic and immunomodulatory role of selected herbs against dermatophytes/ bacteria

Project Leader : Dr. S.K. Dixit

Associate : Dr. F.C. Tuteja

: Dr. (Mrs) D. Suchitra Sena

Following plants were utilized in developing a drug as immunomodulator :

S. N.	Name of the plant	Parts used
1	Gwar Patha (*Aloe vera*)	Root, Bark, Leaves
2	Babool (*Leucaena alidcorephala*)	Root, Bark, Leaves
3	Gilooi (*Tinospora cardiofolia*)	Root, Bark, Leaves
4	Mehendi (*Lowsonia inermislinn*)	Root, Bark, Leaves
5	Tulsi (*Ocimum basilicum*)	Root, Bark, Leaves

Oral feeding of the developed drug at the rate of 25mg/kg body weight once in a day was carried out daily for fifteen days. The feeding did not seem to increase

the levels of globulins, total protein and albumin etc. in the blood. Results of biochemical profiles have been presented in Table - 28.

Table - 28 : Levels of globulin, total protein, albumin, triglyceride, total bilirubin, phosphorus and glucose in the serum of camels fed a herbal immunomodulator drug

Day	Globulin	Total Protein	Albumin	Triglycerides	Total Bilirubin	Phosphorus	Glucose
0	3.35	7.13	3.78	27.50	0.24	5.29	61.50
10	3.21	6.85	3.65	58.17	0.34	6.77	82.33
20	3.04	6.86	3.82	37.67	0.42	7.50	90.50
30	2.89	6.85	3.95	31.67	0.38	6.58	87.33

Unit : Camel Management

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

Project : Studies on camel calf rearing in different system of management

Project Leader : Dr. Champak Bhakat

Associate : Dr. N. Saini

Experiment I

Ten camel calves of 7-10 months of age were divided into two comparable groups containing 5 each. First group was reared under intensive system of management with Saras gold pasu ahar (@ 1 Kg / animal / day) and the second group was reared under semi-intensive system of management. Manger feeding of moth chara (*Phaseolus aconitifolius*) was also carried out for both the management systems.

The average total body weight gain was found to be higher in intensive management (104.20 kg) than semi-intensive management (55.20 kg) after 180 days. The growth rate varied significantly ($P<0.01$) between two systems of management. The average fodder and water intake was slightly higher in intensive management than semi-intensive management group. The feed conversion efficiency was 11.72 ± 0.75. The total cost of feeding a calf for 180 days was Rs. 3034 and Rs. 1843 for first and second group, respectively. But total cost for per kg body weight gain per calf was less in intensive management (Rs. 29.17) than semi-intensive management (Rs. 33.51).

Table - 29 represents the comparative biometrical parameters of calves in two system of management. Biometrical parameters significantly ($P<0.01$) increased in first group than second group after 90, 150 and 180 days.

The level of globulin, total protein and triglyceride significantly ($P<0.05$) increased in first group than second group, but the variation of level of urea and albumin were found to be non-significant. The average concentration of calcium and phosphorus were found to be higher in-group I as compared to group II, although variation was non-significant (Fig - 19 to 22).

Experiment II

In second phase, there were two comparable groups comprising 5 camel calves of 14 to 18 months age in each. First group was reared under intensive system of management with guar phalghati *(Cyamopsis tetragonoloba)*, for 4 months and moth chara (*Phaseolus aconitifolius*) for another 4 months. The second group was reared under semi-intensive system of management. Calves were allowed for 6-7 hr grazing along with manger feeding of similar fodder as provided to the first group.

The average body weight gain was found to be higher in semi-intensive management (85.20 kg) than intensive management (68.95 kg) after 240 days. The total intake / day /kg metabolic body size for intensive group was 0.088 ± 0.005 kg. The average fodder intake from manger was slightly higher in first group than second. The average growth rate varied significantly ($P<0.01$) between two systems of management.

The economic analysis of rearing of camel calves in two system of management is given in Table - 30. The total cost for per kg body weight gain was less in semi-intensive management than intensive management system.

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) were significantly ($P<0.01$) increased in second as compared to first group. Few biometrical parameters viz: hump circumference vertical, footpad width (front) varied significantly ($P<0.05$) and other parameters viz: foot-pad length & width (hind) varied non-significantly.

Table - 29: The comparative biometrics (cm) of camel calves in different system of management

	Intensive system of management					Semi-intensive system of management			
	0 Day	90 Day	150 Day	180 Day		0 Day	90 Day	150 Day	180 Day
BL	82.4 ± 5.3	105.8 ± 4.1	116.2 ± 3.3	121.2 ± 3.5	**	81.9 ± 4.8	99.6 ± 4.5	105.2 ± 4.1	112.6 ± 3.4
HG	108.1 ± 6.7	144.4 ± 3.8	160.4 ± 4.9	169.6 ± 5.3	**	105.6 ± 5.1	132.1 ± 4.6	149.2 ± 5.7	160.2 ± 3.5
HW	127.1 ± 3.3	149.8 ± 3.5	161.8 ± 4.1	172.2 ± 3.1	**	126.7 ± 3.5	138.8 ± 3.8	152.1 ± 3.5	163.2 ± 3.5
HCH	31.6 ± 3.8	47.1 ± 3.6	63.4 ± 3.5	71.2 ± 3.5	**	31.1 ± 3.6	45.3 ± 3.9	57.4 ± 3.9	67.3 ± 3.5
HCV	12.1 ± 4.1	24.3 ± 3.7	28.1 ± 4.1	31.5 ± 3.9	NS	10.0 ± 2.8	21.4 ± 3.5	26.3 ± 3.7	28.4 ± 4.1
NL	62.6 ± 5.3	77.8 ± 5.4	86.2 ± 3.5	91.8 ± 3.5	**	61.2 ± 3.6	70.2 ± 4.9	81.8 ± 3.6	90.1 ± 3.5
LLF	103.1 ± 3.3	116.2 ± 3.4	124.2 ± 3.5	130.2 ± 3.5	**	101.0 ± 3.3	109.3 ± 3.7	118.2 ± 3.4	127.2 ± 3.5
LLH	108.1 ± 4.0	121.3 ± 3.6	131.8 ± 3.6	137.2 ± 3.7	*	106.0 ± 3.3	114.5 ± 3.2	122.2 ± 3.6	132.8 ± 3,3
FPLF	7.0 ± 1.3	9.1 ± 1.8	12.2 ± 1.7	14.2 ± 1.8	*	6.0 ± 1.5	8.2 ± 1.9	10.2 ± 1.9	12.1 ± 1.7
FPWF	6.0 ± 1.1	8.2 ± 1.6	11.3 ± 1.5	14.1 ± 2.1	*	5.0 ± 1.1	7.1 ± 1.8	10.0 ± 1.7	13.2 ± 1.6
FPLH	6.0 ± 1.1	8.3 ± 1.7	11.2 ± 1.9	13.4 ± 1.8	*	5.0 ± 0.7	7.3 ± 1.4	10.3 ± 1.8	12.3 ± 1.0
FPWH	5.0 ± 1.1	7.1 ± 1.5	10.4 ± 1.8	12.3 ± 1.9	*	4.0 ± 1.1	6.5 ± 1.8	9.1 ± 1.7	11.2 ± 1.5

** Significant at 1 %, * Significant at 5 %, NS : Non-significant.
BL: body length, HG: heart girth, HW: height at wither, HCH: hump circumference horizontal, HCV: hump circumference vertical, NL: neck length, LLF: leg length (fore), LLH: leg length (hind), FPLF: footpad length (fore), FPWF: footpad width (fore), FPLH: footpad length (hind), FPWH: footpad width (hind).

Table - 30: The economic analysis of rearing of camel calves in different system of management

Parameters	Intensive system of management	Semi-intensive of management
Total feeding cost for 240 days (Rs./ calf)	3053	2601
Total feeding cost (Rs. / day / calf)	12.72	10.84
Total cost (Rs.) / Kg gain	44.28	30.60

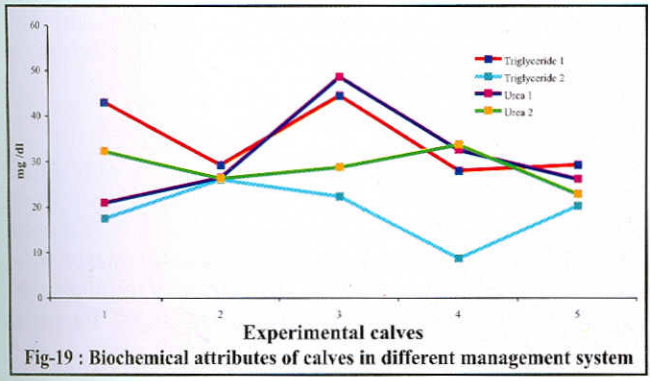


Fig-19 : Biochemical attributes of calves in different management system

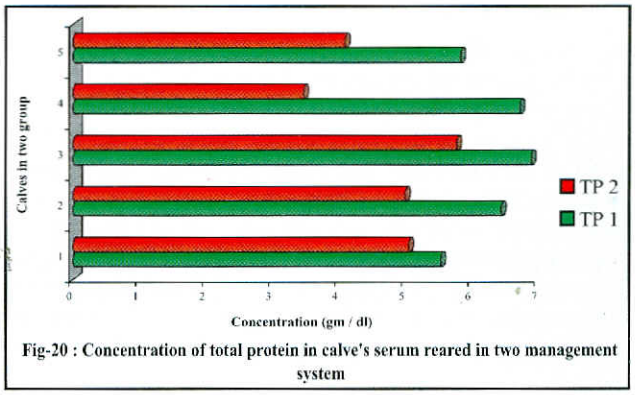


Fig-20 : Concentration of total protein in calve's serum reared in two management system

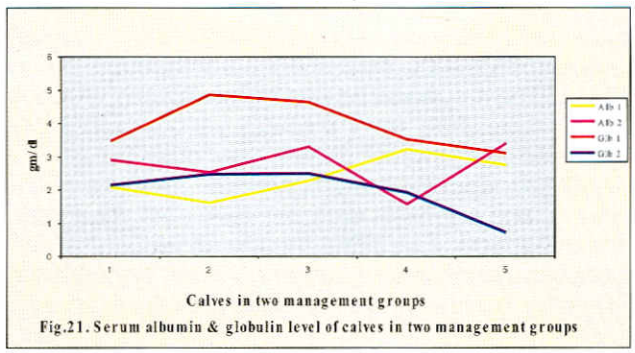


Fig.21. Serum albumin & globulin level of calves in two management groups

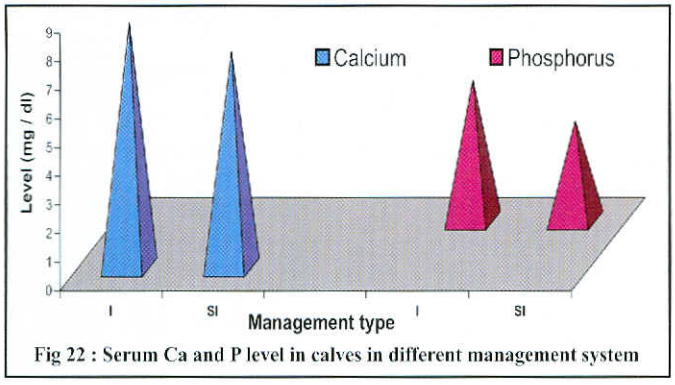


Fig 22 : Serum Ca and P level in calves in different management system

Project on Extension, communication and human resource development

Project Leader : Dr. Champak Bhakat

Associate : Dr. N. Sharma

Scientific Exhibitions

During the year following three exhibitions were organized at out campus :

1. Urmul Setu Sansthan, Lunkarnsar, Bikaner on 12.2.07 to 13.2.07, Theme -"Economic utilization of camel for mankind"
2. Udhog Craft Mela, Bikaner on 5.2.07 to 11.2.07, Theme "Camel research achievements and hair and milk products"
3. Camel festival at Katariasar, Bikaner on 3.1.07. Theme -"Potentiality of utilization of camel".

Field day

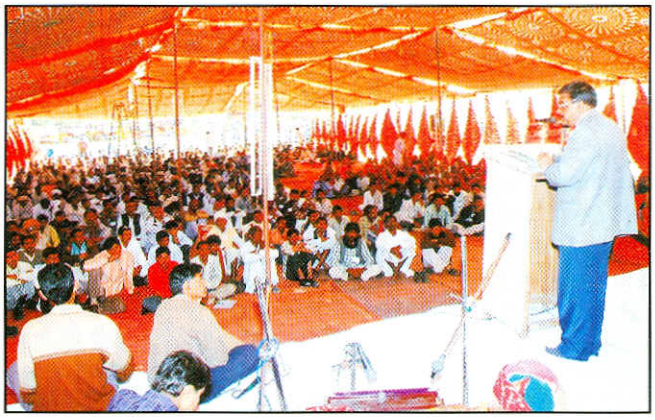
A field day was organized and conducted at interior village Morkhana, Bikaner on 23.1.07. A substantial number of camels were treated and distributed medicines free of cost. Camel health related problems were discussed and feed back was gathered by scientist. Handouts on various aspects of scientific camel rearing were distributed to farmers free of cost.

Transfer of technical know how

Efforts have been made to transfer / popularize the technical know how of light arrangement in camel cart and technical know how of preparation of camel milk products to field level through various approaches. Flavored milk, cheese, paneer, tea/coffee of camel milk have provided to various national and international visitors and scientists gathered feed back regarding all these aspects. Electrified traditional two wheel camel cart was demonstrated about how it can be beneficial in avoiding accidents during night and as a source of electricity in areas / dhanies which are not electrified.

Kissan Gosthies

There was participation in four Kissan Gosthies viz: two days at Urmul Setu Sansthan, Lunkaransar on 12.2.07 & 13.2.07, at Himtasar, Bikaner on 25.5.06, two at NRCC on 25.8.06, 26.2.07. During the gosthi camel keepers were apprised about advance breeding practices, camel diseases, the modern management practices followed at an organized farm, feed block and functioning of various laboratories etc. The scientists of Centre gathered feedback from farmers about the traditional camel husbandry practices.



Participation in camel competitions etc.

The Centre participated and awarded for various competitions at Camel Festival-07, viz.: newly born camel calf, milking competitions, camel race etc.

Demonstration of Centre's research activity

Various trainees, visitors (national/ international), scientists, students, (from veterinary colleges, medical colleges, SAUs, schools, universities), livestock owners, administrators, defence officers, N.G.O.s, Indian and foreign educationists, journalists, youth, farmers and farm women etc. were demonstrated about on going research activity, camel husbandry practices, and latest technology know- how of the centre during the reporting period.

Collaboration

Collaborations were continued with NGO namely LPPS, Sadri, Pali, URMUL Dairy and Trust, Bikaner, KVK, RAU, Beechwal and CSWRI, Avikanagar. An effort was made for popularization of camel hair, milk, skin utility aspects of camel etc. An investigation was carried out on product making possibilities by using camel hair, skin etc.

Revenue generation programme

All efforts were made to strengthen the revenue / resource generation and sizeable amount of revenue were generated through various possible ways viz. entry fee, still photography, camel riding & also through selling of camel hair etc. Camel museum (newly built) was extended in a bigger hall and made much more scientific and informative which attracts more number of tourists and generates more revenue for our centre.

Unit : Camel Nutrition

Programme : Studies on feed requirements and feed resources evaluation in camel for optimum production

Project : Voluntary feed intake, milk production and body weight changes of lactating camel

Project Leader : Dr. A.K. Nagpal

Nine lactating camels (10-13 years; average body weight 642.94± 16.64 kg) of Bikaneri and Kachchi breeds in their second/third parity were kept on diet consisting of guar straw, groundnut haulms and concentrate mixture (57: 29 : 14) to provide 11.12% CP and 58.6 % TDN for 72 days during the first to third month of lactation. The DM intake was observed to be 12.75 ± 0.19 kg/d or 1.99 ± 0.05 kg/100 kg body weight. The average daily milk yield of camels was 4.27 ± 0.16 liter in the morning and 4.04±0.36 liter in the evening with total yield of 8.31± 0.36 liter. The milk production in terms of litter per kg dry matter intake worked out to be 0.65 ± 0.03. The average body weight of camels during the initial period was 658.00 ±16.37 kg and after 72 days of lactation period was 627.89 ± 17.79 kg, the body weight loss was of the order of 4.58%. Total loss in the body weight of lactating camels was of the tune of 30.11± 7.87 kg or 418.21±108.54 g/day. Loss in body weight of lactating camels reflected that the present feeding level was short of nutrient supply to maintain the normal body weight. Higher feeding level was required to prevent the reduction in body weight and also to achieve higher milk production from camels. The study indicated that Indian camel has good potential for milk production provided they are fed and managed on scientific lines.

Project : Comparative performance of dry and lactating camels under arid ecosystem of Rajasthan

Project Leader : Dr. A.K. Nagpal

Performance of four lactating camels (average body weight 625.75± 24.58 kg) in their second/ third parity during their fourth to seventh month (June to August, 2006) of lactation and four non-pregnant, non-lactating camels (562.25 ± 28.81 kg) of Kachchi breeds, kept on diet consisting of guar straw, groundnut haulms and concentrate mixture (60: 20 : 20) to provide 11.6% CP and 59 % TDN for 92 days was compared. The DM intake was observed to be 11.27±0.13 kg /day or 1.85 ± 0.06 kg/100 kg body weight in lactating camels while it was 10.47±0.12 kg /day or 1.84 ± 0.12 kg/100 kg body weight in dry camels. The average daily milk yield of camels was 4.45 ± 0.27 litre in the morning and 4.43± 0.23 litre in the evening with total yield of 8.90.± 0.49 litre. The milk production in terms of dry matter intake /litre milk was 1.28 ± 0.07 kg. While dry camels gained 21.00±3.34 kg or 228.26±36.32 g/d, total loss in the body weight of lactating camels was 28.25± 2.02 kg or 307.07±21.91 g/d. Loss in body weight of lactating camels reflected that the present feeding level was not enough in nutrient supply to maintain the normal body weight while the feeding level of dry camels was higher than the requirement for maintenance. Higher feeding level for milch camels was required to prevent reduction in body weight and also to achieve more milk production from the camels. The study indicated that Indian camel has very good potential for milk production provided they are scientifically fed and managed.

Collaborative Inter institutional Projects

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

Project Leader : Dr. R.C. Sharma

(Senior Scientist, NRC on Equines)

Associates : Dr. S.C. Mehta

: **Dr. R.S. Bansal** (V.O., NRC on Equines)

A total of 28 blood sample of Marwari horses (12

blood samples from EPC and 16 from field) were collected. The PCR amplification of the MHC- Be and MHC-DRB2 loci was accomplished using the primers MHC-Be 1& Be2 and MHC-DRB 2a and 2b and amplicons of 229 bp and 276 bp were resolved in 49 DNA samples of Marwari horses (Table - 31).

Table - 31: Amplification of DRB 2 and Be loci in Marwari horses

S. No.	Locus	N	MHC	Size (bp)
1	MHC- Be	49	ELA	229
2	MHC-DRB 2	49	ELA	276

Project : Molecular and Bio-Chemical studies of acute intermittent porphyria in human patients

Project Leader : Molecular genetics Component : Dr. S.C. Mehta

Clinical and Biochemical Component :

Dr. D. Kochar

(Professor, S.P. Medical College, Bikaner)

Associate : Dr. S. Kochar

(Asstt. Professor, S.P. Medical College, Bikaner)

Sequence analysis of seven samples was carried out and one sequence (677 bp) was deposited and accepted by the NCBI Gene Bank with accession numbers DQ915447. Sequencing of the eight more samples representing different stretch or of different exons/introns of the gene of different patients was also carried out. The sequence analysis is in progress.

AICRP

AICRP on improvement of feed resources and nutrient utilization in rasing animal production

Project Leader: Dr. G. P. Singh

Associate : Dr. (Mrs.) Nirmala Saini

Samples of feed & fodders commonly fed and browsed by camels from four agro- climatic zones (zone I : Bikaner, Jaisalmer; zone II : Hanumangarh, Ganganagar; zone III: Churu, Nagaur and zone IV : Pali, Jodhpur) were analyzed for their proximate analysis, cell wall contents and mineral composition to find out deficiency of macro and micro nutrients. The ash content in feeds ranged from 4.25 to 18.90 % while, acid insoluble ash ranged from 1.51-9.84 %. Calcium, Phosphorus, Magnesium and Manganese were found adequate to meet requirements of these minerals of camel. Iron content was higher in all tested feeds ranging from 355-672.9 ppm, Zinc was deficient in both straws & tree leaves whereas Copper was deficient only in the straw. These deficient trace minerals required supplementation in ration (Table - 32 and 33).

A simple technique for collection of rumen liquor i.e., trocharization of rumen compartment C 1 was developed for *in vitro* studies.

Sowing of barley, oat, taramira, lucerne, sewan and grammna was undertaken respectively in 1, 7, 25, 0.15, 1 and 2 ha land of farm area. A total of 625.19 q green fodder (167.92 barley, 390.35 oat, 14.95 sewan, 27.70 grammna and 24.27 lucerne) were produced (Table 34). Seed of barley (19.35 q), oat (73.80q) and taramira (19.67 q) was also produced.

Table - 32. Mineral status in tree leaves

Zones	%				ppm			
	Ca	Mg	P	Cu	Fe	Mn	Co	Zn
Critical limit	0.3	0.2	<0.25	<8.0	<50	<40	<0.10	<30
I	0.80	0.52	0.90	8.69	637.0	61.67	0.73	24.6
II	0.94	0.61	0.87	9.19	494.7	65.83	0.79	26.4
III	0.68	7.08	1.43	19.29	510.4	18.18	0.78	24.9
IV	0.88	0.53	0.94	9.00	574.3	71.30	0.82	28.3
Mean	0.83	2.19	1.04	11.54	554.1	54.20	0.78	26.0

Table - 33. Mineral status in leguminous straws

Zones	%				ppm			
	Ca	Mg	P	Cu	Fe	Mn	Co	Zn
Critical limit	0.3	0.2	<0.25	<8.0	<50	<40	<0.10	<30
I	0.31	0.39	0.72	7.06	559.3	44.63	1.69	15.60
II	0.36	0.41	0.76	7.41	672.9	57.51	3.36	16.64
III	0.35	0.49	0.68	8.17	499.4	56.03	6.25	17.10
IV	0.43	0.44	0.62	7.32	355.5	53.32	3.75	20.65
Mean	0.36	0.43	0.70	7.49	521.7	52.90	3.76	17.50

Table - 34. Productions at farm

No. of crop	Green Fodder (q)	Straw (q)	Seed (q)
Barley	167.92	23.10	19.35
Oat	390.35	103.50	73.80
Sewan	14.95	NIL	NIL
Grammna	27.70	NIL	NIL
Tara Mira	NIL	48.00	19.67
Lucerne	24.27	NIL	NIL
TOTAL	**625.19**	**174.6**	**112.82**


RESEARCH

4

Technology Assessed and Transferred

Molecular markers based characterization of camel breeds

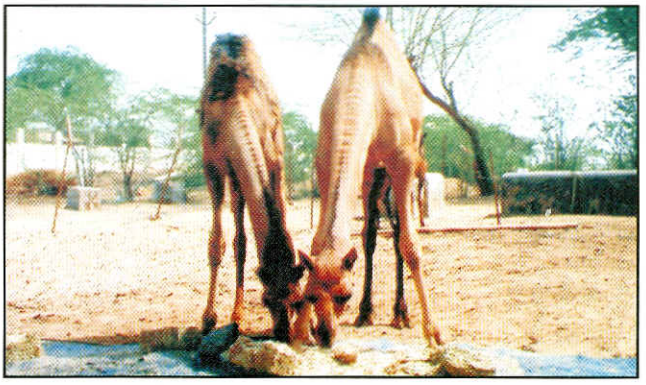
Eighteen microsatellite primers have been found to be polymorphic with 2 to 7 alleles in Indian dromedary breeds. The expected heterozygosity ranged from 0.29 to 0.82. The co-dominant inheritance was assessed and hence can be utilized for individual identification and parentage testing.

ELISA and PCR based diagnosis of surra

ELISA based on detection of anti-trypanosoma antibodies and PCR based on ITS-1 and ITS-2 primers for diagnosis of camel surra have been successfully standardized for diagnosis of surra in camel. These technologies have greatly improved the efficiency of diagnosis of surra over routinely used field tests.

Complete feed block developed

Complete feed blocks were prepared by mixing



dry and green fodders and agricultural by-products. It provides appropriate amount of energy, protein and mineral elements for optimum health & production. It has been proved as a perfect technology for maximizing the efficiency of the utilization of the scarcely available feed and fodder, decrease the fodder losses, provide convenient transportation and storage.

Herbal formulation for treatment of mange in camel

An herbal formulation M-cure for treatment of skin diseases of camel has been developed at the Centre and application for patent of this formulation has been filed.

Artificial collection of semen from camels, its evaluation and preservation

The technique of artificial collection of semen from camels through artificial vagina method has been perfected. Freshly ejaculated camel semen exhibits no mass motility. It was documented that absence of mass motility in camel semen is apparently due to entrapment of spermatozoa in a unique kind of sperm depot, in which spermatozoa are non-motile. Spermatozoa develop motility only after liberation from this depot. The liberation of spermatozoa from this depot is a continuous uninterrupted process continuing for a prolong period. Apparently this serves a purpose of sperm bank in the female genital tract. It has been observed that although the sperm depot remained non-miscible with the extenders but despite that Tris extender used to extend camel semen can maintain the viability of spermatozoa for several weeks in the laboratory.

5

Education and Training, Awards

One month training programme

NRC on Camel regularly organizes one-month training programme for graduate students of various discipline viz. B.Sc. (Bio-technology), B.E. (Engineering), B.Sc. (Microbiology) and similar fields. This year this program was organized from May 8 to June 7, 2006. During this period, they were exposed to various technologies used for research in camel genetics and breeding, camel health, camel physiology and reproduction, camel nutrition, camel management and production. They are also exposed to use of computer and library as an aid to research programs.

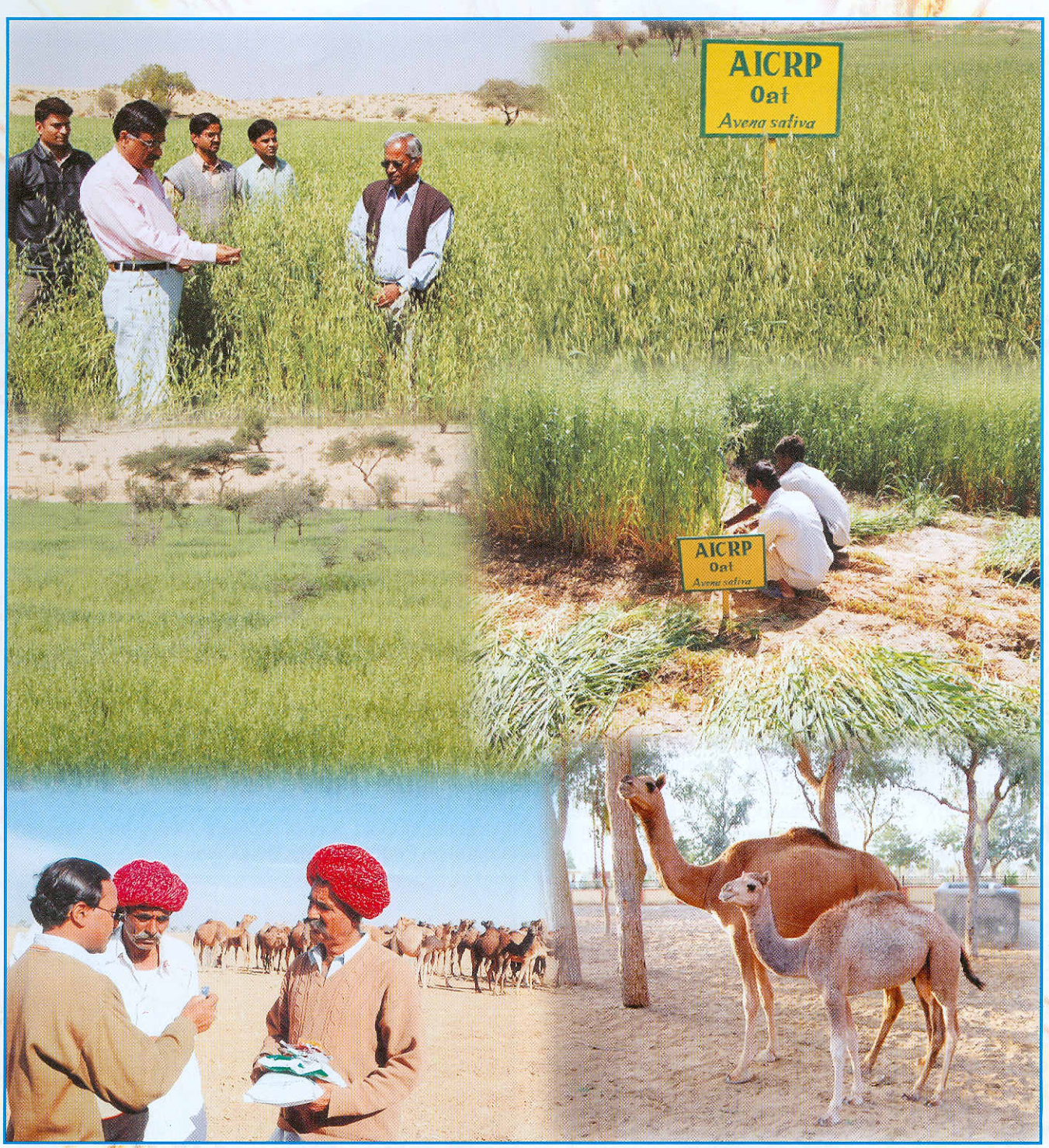
Two, three and four months training programme

NRC on Camel also organizes two, three and four months training program for dissertation to post graduate students of Biotechnology. This year 27 students completed their dissertation, which included 20 for 2 months, 1 for 3 months and 6 for 4 months.

Training program was also arranged for Dr. K.K. Sharma, Veterinary Officer from Apollo Veterinary College, Jaipur (From 12.07.2006 to 26.07.2006)

Awards

1. Dr. M.S. Sahani, Ex-Director was honoured with International Gold Star Millennium Award from Citizen Integration Peace Society, New Delhi.

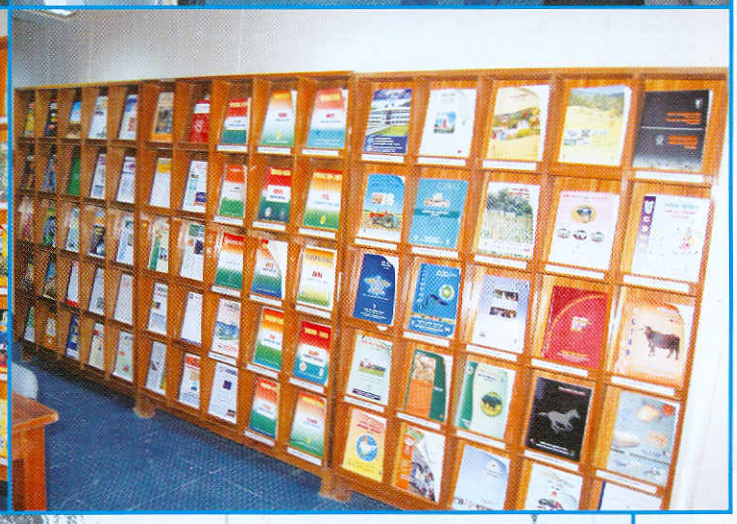

AICRP
Oat
Avena sativa
AICRP
Oat
Avena sativa

6

Linkages and Collaborations

National Level

Collaborative University/ Institute		Programme
Rajasthan Agricultural University, Bikaner	:	Research work of M.V.Sc and Ph.D students
National Dairy Research Institute, Karnal	:	Camel milk analysis especially on protective proteins
Center for Sheep and Wool Research Institute, Avikanagar	:	Camel hair and its utilization in the form of blends
Central Institute of Agricultural Engineering, Bhopal (M.P.)	:	Camel drawn implements & their performance
S.P. Medical College, Bikaner	:	Camel milk as nutritional adjuvant in treatment of type-I diabetes and analysis of PBGD gene
AIIMS, New Delhi	:	Structure of protective proteins and its functional activity
Lokhit Pashupalan Sansthan, NGO at Sadri, Pali	:	Extension of camel husbandry practices



7

List of Publications

Research paper published

1. Aminu Deen and Sahani, M.S. (2006): Superovulation response to a progestagen ear implant, PMSG and HCG Treatment in female camels. *Israel Journal of Veterinary Medicine,* **61 :** 60-63. (6.7)
2. Aminu Deen and Sahani, M.S. (2006): Cryopreservation of camel semen. *Journal Camel Practice and Research* **13**: 1-6. (6.6)
3. Aminu Deen, Vyas Sumant, Sahani, M.S., Saharan, Priti, Isha Sevta and Chhabra Shalini. (2007): Estradiol and progesterone profiles of female camels at different stages of reproduction. *Israel Journal of Veterinary Medicine.* **62 :** 21-26. (6.7)
4. Bhakat Champak (2006): Calving pattern and neonatal behavior in Indian dromedary camel. *Indian Veterinary Journal,* **83 :** 416 418. (6.0)
5. Bhakat Champak (2006): Diagnosis and management of metabolic disorders in high yielding dairy cattle. *Journal of Indian Veterinary Association,* **4:** 36-39.
6. Bhakat Champak and Sahani M S (2006): Camel: A unique species in hot arid desert ecosystem. *Everyman's Science,* **XL :** 426-429.
7. Bharadwaj, A., Kiradoo, B.D., Saini, N. and Sahani, M.S. (2007): Fate of organic farming in contrast to conventional farming systems- A thrust to organic food. *Emirates Journal of Agricultural Sciences,* **18** :47-51.
8. Gorakh Mal, Sena, D.Suhitra, and Sahani, M.S. (2006): Milk production and keeping quality of camel milk. *Journal of Camel Practice and Research,* **13:** 175-178. (6.6)
9. Gorakh Mal, Sena, D.Suhitra, and Sahani, M.S. (2006): Haemato-biochemical change in camels infested with mange during winter and summer season. *Journal of Camel Practice and Research,* **13:** 173-174. (6.6)

10. Gorakh Mal, Sena, D.Suhitra, Jain, V.K. and Sahani, M.S. (2006): Therapeutic utility of camel milk as nutritional supplement against multiple drug resistant (MDR) patients. *Israel Journal of Veterinary Medicine*, **61** : 88-91. (6·7)

11. Jain, R., Mehta, S. C. and Bhojak, N. (2006): Micellar spectral investigations of Nd (III) complex with semicarbazones. *Acta Ciencia Indiaca*, **32:** 65.

12. Mehta, S.C. and Sahani, M.S. (2007): Microsatellite markers for genetic characterisation of Bikaneri camel. *Indian Journal of Animal Sciences*, **77 :** 509-512. (6·6)

13. Mehta, S.C., Bhardwaj, B. and Sahani, M. S. (2007): Status and conservation of Mewari and Jaisalmeri camels in India. *Animal Genetic Resources Information*, FAO, **40** : 87-101.

14. Mehta, S.C., Goyal, A. and Sahani, M.S. (2007): Microsatellite markers for genetic characterization of Kachchhi camel. *Indian Journal of Biotechnology*, **6**:336-339. (6·8)

15. Mehta, S.C., Mishra, B. P. and Sahani, M. S. (2006): Genetic differentiation of Indian camel (*Camelus dromedarius*) breeds using random oligonucleotide primers. *Animal Genetic Resources Information*, FAO, **39**:77-88.

16. Sahani, M.S., Bapna, D.L. and Mehta, S.C. (2007): Growth of Karakul and its crosses with indigenous sheep breeds. *Indian Journal of Animal Sciences*, **77** : 346-48. (6·6)

17. Saini, N. and Singh, G.P. (2006): Effect of weaning on growth performance and economics of camel calf rearing. *Indian Journal of Dairy Science*, **59 :** 344-345. (4·8)

18. Saini, N., Ram Kumar, Kiradoo, B.D., Singh, N., Bharadwaj, A. and Sahani, M.S. (2006): Camel rearing practices:- a survey study in arid western agro-ecosystem of Rajasthan. *Journal of Camel Practice and Research*, **13** : 179-184. (6·6)

19. Saini, N., Sahani, M.S., Kiradoo, B.D., Purohit, R. and Ram Kumar (2006): Effect of *Panicum antidotale* grass on the performance of camel under semi-intensive conditions. *Indian Journal of Animal Nutrition*, 23 :188-189. (4·6)

20. Sena, D. Suchitra, Pandey, N.N. and Rathore, R.S. (2006): Characteristics of diarrhoea with *Escherichia coli* as major cause in new born calves having adequate serum Ig concentration. *Indian Journal of Animal Sciences*, **76** : 659-663. (6·6)

21. Sena, D. Suchitra, Gorakhmal and Bhati, A.K. (2007): Comparative studies on micro-mineral profile of pregnant camels, calves and dry female camels. *Indian Veterinary Journal*, **84** : 698-700. (6·0)

22. Sena, D. Suchitra, Gorakhmal, Sharma, N. Sahani, M.S. (2006): Calf mortality in camels: a report. *Journal of Camel Practice and Research*, **13**: 171-172. (6·6)

Chapters contributed in Books

1. Agarwal, R.P., Tuteja, F.C., Sahani, M.S., Ghorui, S.K. and Raghvender Singh (2006). A chapter on "Camel milk as an nutritional adjunct supplement in the management of Type I Diabetes". Book entitled The Indian Camel : A Research Profile, pp: 51-58.

2. Aminu Deen and M.S. Sahani (2006). A chapter on "Artificial Insemination in Camel". Book entitled The Indian Camel: A Research Profile, pp: 7-40.

3. Aminu Deen and M.S. Sahani (2006). A chapter on "Estradiol profiles in unmated female Camel". Book entitled The Indian Camel: A Research Profile, pp: 41-50.

4. Aminu Deen and M.S.Sahani (2006). A chapter on "Testosterone profiles and their correlation with sexual libido in male camels". Book entitled The Indian Camel: A Research Profile, pp128-139.

5. Bhakat Champak (2006). A chapter on "Camel Production and Management." Book entitled hand book of Animal husbandry Sciences, 2nd ed, pp: 260 - 280.

6. Bhakat Champak and Sahani M.S (2006). A chapter on "Camel management in arid and semi-arid eco-system". Book entitled The Indian Camel: A Research Profile, pp: 112-127.

7. Ghorui, S.K. Singh, R. and Sahani, M.S.(2006). Important Parasitic Diseases of Indian Dromedary Camel. Book entitled The Indian Camel : A Research Profile, pp: 210-220.

8. Mal, G., Jain, V.K., Sena, D.S. and Sahani, M.S. (2006). Therapeutic utility of camel milk in tuberculosis patients. Book entitled The Indian Camel : A Research Profile, pp: 140-144.

9. Mehta, S.C. and Sahani, M.S. (2006). Indian Camel Breeds. Book entitled The Indian Camel A : Research Profile, pp: 74-103.

10. Nagpal , A.K. (2006). A chapter on "Nutritional

Aspects of Camel". Book entitled The Indian Camel: A Research Profile, pp 176-209.

11. Raghvender Singh, Ghorui, S.K. and Sahani, M.S. (2006). Camel milk: Properties and processing potential. Book entitled The Indian Camel : A Research Profile, pp: 59-73.
12. Sahani M S, Bhakat Champak and Mehta S C (2006). A chapter on "Camel hair production, quality and prospects". Book entitled The Indian Camel : A Research Profile, pp: 104-111.
13. Sumant Vyas, Aminu Deen and M.S. Sahani (2006). A chapter on "Use of ultrasonography in camel reproduction" Book entitled The Indian Camel: A Research Profile, pp: 145-175.

Papers presented in Conferences/ Seminar/ Symposia

1. Aminu Deen (2007): AI in camel is not successful. International Camel Conference, College of Veterinary and Animal Sciences, Bikaner 16-17 February 2007, pp : 41-42.
2. Aminu Deen (2007): Circulating testosterone profiles and its correlation with sexual libido in male camels. International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007, pp : 38
3. Aminu Deen and Nand Kishore (2007): Estradiol hormone profiles of unmated female camels during breeding season. International Camel Conference, College of Veterinary and Animal Science, Bikaner 16-17 February 2007, pp : 43.
4. Bhakat Champak and Sahani M S (2006). Comparative Study on Farming Use of Camel and Bullock Systems in Hot Arid Villages of Thar Desert. National Symposium on Livelihood Security and Diversified Farming Systems in Arid Region, CAZRI, Jodhpur, Rajasthan : 130, 14-16 June, 2006.
5. Bhakat Champak and Sahani M S (2006). Livelihood of Pastoralists through Camel Management in Arid Region. National Symposium on Livelihood Security and Diversified Farming Systems in Arid Region, CAZRI, Jodhpur, Rajasthan : 130-131, 14-16 June, 2006.
6. Bissa, U. K. and Yadav, S. B. S., (2007). Association between various biochemical parameters and growth characteristics in Indian camel (*Camelus dromedarius*). International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007, pp : 79.
7. Bissa, U. K. and Yadav, S. B. S., (2007). Genetic and phenotypic parameters of growth traits in Bikaneri camels (*Camelus dromedarius*). International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007, pp : 21.
8. Bissa, U. K. and Yadav, S. B. S., (2007). Parity specific demographic parameters in Indian camel. International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007, pp : 20.
9. Bissa, U. K. and Yadav, S. B. S., (2007). Total protein, urea nitrogen and activity of amylase and factors affecting them in growing camel calves (*Camelus dromedarius*). International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007, pp : 82.
10. Dixit, S.K., Tuteja, F.C., Singh, A.P. and Sharma, N. (2007): Sarcopticosis in one humped camels- its management with herbals and immunomodulation. International Camel Conference College of Veterinary and Animal Science, Bikaner, 16-17 February 2007, pp : 108.
11. Gorakh Mal and Aminu Deen (2007): Viability assessment of camel sperms using Hoechst 33258. International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007, pp : 44.
12. Gorakh Mal, Aminu Deen, Sena, D. Suchitra and Mehta, S.C. (2007): SDS-polyacrylamide- Gel Electrophoresis of semen proteins of Jaisalmeri camels. 8th Agricultural Science Conference, Coimbatore, 15-17 February 2007.
13. Mehta, S.C. (2007). Camel development scenario in India.: ASCAD symposium on "Strengthening of disease diagnostic facilities for sustainable livestock and poultry development. Organised by the Department of Animal Husbandry, Government of Rajasthan at Udaipur from March 11 - 12, 2007. pp : 56-61.
14. Mehta, S.C., Bhardwaj, B., Arora, S., Bhatnagar, C.S. and Pathak, K.M.L. (2007). Camel milk: A source of livelihood and sustenance of camel.: International camel conference. College of Veterinary and Animal Science, Bikaner, February 16 - 17, 2007. pp : 99.

15. Mehta, S.C., Bhure S.K.and Pathak, K.M.L. (2007). Cloning and characterization of camel milk protein genes : National Conference on Emerging Trends in Microbiology and Biotechnology. Dr. Tanveer Malawat College of Biosciences, Bikaner from January 29 - 30, 2007. pp : 117.

16. Mehta, S.C., Bhure, S.K. and Pathak, K.M.L. (2007). Genotypic evaluation of camel breeds of India.: International Camel Conference. College of Veterinary and Animal Science, Bikaner, February 16 - 17, 2007. pp: 17.

17. Nagpal, A.K. (2006). Influence of different levels of energy and protein on nutrient utilization and performance of pregnant camels. Proceedings of VI Biennial Conference of Animal Nutrition Association, Sher-e-Kashmir University of Agriculture Technology, Jammu, 15-17 September, 2006. pp : 94.

18. Nagpal, A.K., Roy, A.K. and Jakhmola, R. C. (2007). Production potential of Pala (*Zizyphus nummularia*) leaves for rutting camels. International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February, 07, pp. 56.

19. Nagpal, A.K., Singh, G.P., Saini, N. and Jayant P. (2007). Voluntary feed intake, serum profile, growth performance and economics of weaned camel calves. International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February, 07, pp : 61.

20. Pathak, K.M.L., Ghorui, S.K. and Suchitra Sena, D. (2007). Camel disease diagnostics: Present and Future Scenario. ASCAD Symposium on "Strengthening of disease diagnostic facilities for sustainable livestock and poultry development", Udaipur, 10 - 11 March, 2007.

21. Rathod, A., Singh, A.P., Dixit, S.K., Dadhich, H., Tanwar, R.K. and Chaher, A. (2007): Some observations on sarcopticosis in camels (*Camelus dromedarius*). International Camel Conference, College of Veterinary and Animal Science, Bikaner, India. 16-17 February 2007 pp : 105.

22. Rathod, A., Singh, A.P., Dixit, S.K., Singh, B. and Meena, D.S. (2007): Effect of various treatments on sarcopticosis in camels (*Camelus dromedarius*). International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007 pp : 114.

23. Roy, A. K. (2007) Effect of biochemical, hormonal and behavioural factors at the beginning of puberty in young male camels. International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February, 2007, pp : 39.

24. Saini, N., Kiradoo, B.D., Singh, N., Bharadwaj, A., Ram Kumar and Sahani, M.S. (2006): Traditional camel rearing practices:- a survey study in arid western agro-ecosystem of Rajasthan. Animal Nutrition Conference, Sher-e- Kashmir University of Agriculture and Technology, Jammu, 15-17 September 2006, pp : 372.

25. Saini, N., Kiradoo, B.D., Singh, N., Bharadwaj, A., Ram Kumar and Sahani, M.S. (2006): Micronutrient content of certain conventional and unconventional feeds of arid western zone of Rajasthan. International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007. pp: 54.

26. Saini, N., Singh, N., Kiradoo, B.D., Ram Kumar, Bharadwaj, A. and Sahani, M.S. (2006): Field study of the management and reproduction of camels in arid western agro ecosystem of Rajasthan. Animal Nutrition Conference, Sher-e-Kashmir University of Agriculture and Technology, Jammu, 15-17 September 2006, pp : 296.

27. Sena, D. Suchitra. (2007). Comparative studies of two different feeding practices on the growth rate and passive immune status in neonatal camel calves. International Camel Conference, College of Veterinary and Animal Science, Bikaner, February 16-17, 2007.

28. Singh, A.P., Dixit, S.K., Dadhich, H., Sharma , T., Fakhruddin and Rathod, A. (2007). Biochemical and histopathological studies of sarcopticosis in camel (*Camelus dromedarius*). International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007. pp : 110.

29. Tuteja, F.C. and Dixit, S.K. (2007): Studies on treatment and control of intramammary infections in camels. International Camel Conference, College of Veterinary and Animal Science, Bikaner, 16-17 February 2007, pp : 7.

30. Yadav, S.B.S., Bissa, U.K., Mehta, S.C., Pannu, U., Murdia, C.K., Gahlot, G.C., Joshi, R. and Swami, P.D. (2007). Status and prospectus of research on genetics and breeding aspects of Indian camels in Rajasthan. : International Camel Conference, College of Veterinary and Animal Science, Bikaner, February 16 - 17, 2007. pp : 25.

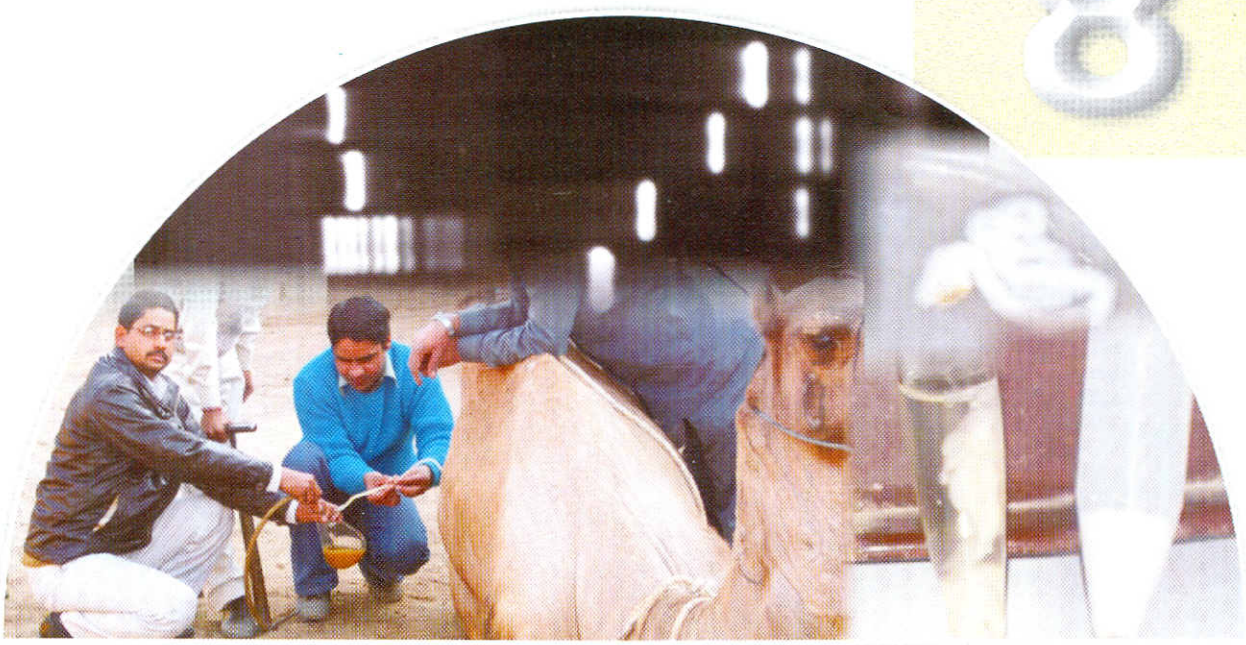
Articles Published in Hindi

1. अश्विनी कुमार रॉय (2006) : ''इथोलॉजी-ऊँटों में सामान्य व्यवहार'', करभ, 4 : 21-23, राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़, बीकानेर
2. अश्विनी कुमार रॉय (2006) : ''जानवर भी दु:खी होते हैं'' *करभ, 4 :* 82-83, राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़,बीकानेर
3. चम्पक भकत, यू.के.बिस्सा एवं जी.पी.सिंह (2006): ''वैज्ञानिक प्रणाली द्वारा नवजात ऊँटों का परिपालन'', *करभ,4:*.35-37, राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़,
4. दिनेश मुंजाल, (2006): ''संक्रमित ई-मेल से बचिए'', *करभ, 4:68-70*, राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़, बीकानेर
5. एस.के.दीक्षित, एफ.सी.टुटेजा एवं डी.एस.सेना (2006): वातावरण परिवर्तन के समय पशु स्वास्थ्य की देखभाल, *करभ,4:32-34*, राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़, बीकानेर
6. गोरखमल एवं डी.एस.सेना (2006) : दो कुबड ऊँट के बालों की विशेषताएं व उत्पाद, *करभ,4:41-42* राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़, बीकानेर
7. एस.सी. मेहता एवं आर.एल. व्यास (2006) : उष्ट्र विकास एवं संरक्षण करभ, 4 : 54-55, राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़, बीकानेर
8. ए.के.नागपाल (2006) : ''पशु आहार व प्रौद्योगिकी'' *करभ, 4:71-74*,राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़, बीकानेर
9. ए.के.नागपाल (2006) : प्रदेश के पशुधान को अकाल से कैसे बचाएं? *करभ,4:18-20* राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़, बीकानेर
10. एफ.सी.टुटेजा एवं एस.के.दीक्षित (2006): शारीरिक तापमान, नाडी गति व श्वसन किया से पशु स्वास्थ्य को जानें, *करभ, 4 : 56-58* राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, जोड़बीड़, बीकानेर

Technical bulletin

S.C. Mehta and K.M.L. Pathak. (2007). Production, improvement and status of Kachchhi breed of camel. Published by Director, National Research Centre on Camel, Bikaner, Rajasthan.

8



List of Approved Ongoing Projects

List of approved ongoing projects

Program : Improvement of reproductive efficiency and to study the causes of reproductive failures in camel.

Activity - 1 Investigations into trends of Estradiol profiles of unmated female camels.

Activity - 2 Research on Artificial Insemination in camel.

Activity - 3 Isolation and characterisation of the major gel proteins in camel semen.

Activity - 4 Development of RIA facilities for reproductive hormones.

Program : Surveillance, monitoring and control of camel disease

Activity - 1 Comparative studies on the sensitibility of polymerase chain reaction (PCR) and Serological tests for diagnosis of trypanosomosis.

Activity - 2 Therapeutic spectrum of selected herbs against dermatophytes / bacteria.

Activity - 3 Immunity status in neonatal calves under three different management practices.

Activity - 4 Indigenous system of medicine against skin affections in camel- mange.

Activity - 5 Studies on mastitis in camels

Program : Genetic characterization, evaluation and conservation of indigenous camel breeds

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

Activity - 2 Molecular genetic studies in Indian camel.

Activity - 3 Molecular Cloning, Characterization, and Promoter analysis of the camel milk protein genes.

Activity - 4 RFLP - based genotyping of major histo-compatibility complex class II genes in Marwari horses.

Activity - 5 Molecular and biochemical studies of acute intermittent porphyria in Indian patients and their families.

Activity - 6 Selection for the improvement of draughtability of camel breeds.

Program : Improvement of the working efficiency of camel under arid and semi arid conditions

Activity - 1 Efficient utilization of camel energy during cart pulling and agricultural operations by camels.

Activity - 2 Evaluation of camel milk proteins and their applications.

Program : Studies on feed requirement and feed resources evaluation in camel for optimum production

Activity - 1 Comparative performance of dry and lactating camels under arid ecosystem of Rajasthan.

Activity - 2 AICRP on "Improvement of Feed Resources and Nutrient Utilization in Raising Animal Production".

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

Activity - 1 Studies on camel calf rearing in different systems of management.

9

QRT, RAC, Management Committee and SRC

Management Committee, Research Advisory Committee and Institute Research Committee Meetings

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 broad 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 :

1	Dr. M.S. Sahani (up to 31.08.2006) Director, N.R.C.C.	:	Chairman
2	Prof. K.M.L. Pathak (w.e.f. 13.12.2006) Director, N.R.C.C.	:	Chairman
3	Dr. O.P. Dhanda (Up to 31st March, 2007) Assistant Director General (AN&P) ICAR, Krishi Bhavan, New Delhi	:	Member
4	Dr. C.S. Prasad (w.e.f.14th May, 2007) Assistant Director General (AN&P) ICAR, Krishi Bhavan, New Delhi	:	Member
5	Prof. A.K. Gehlot Dean College of Veterinary & Animal Science, RAU, Bikaner	:	Member

6	Director Department of Animal Husbandry Government of Gujarat Ahmedabad, Gujarat	:	Member
7	Director, Department of Animal Husbandry Government of Rajasthan Jaipur	:	Member
8	Sri Shri Gopal Upadhyaya Ex-Sarpanch, Inside Idagah Bari, Dharam Nagar, Bikaner	:	Member
9	Sh. M.K. Jhajharia Village & Post Keharpura Kalan Tehsil-Chirawa Distt. Jhunjhunu, Rajasthan	:	Member
10.	Dr. Aminu Deen Principal Scientist N.R.C.C.	:	Member
11.	Dr. S. Kaushish Principal Scientist CAZRI Jodhpur	:	Member
12	Sh. O.P. Nagar Finance & Accounts Officer, Central Sheep and Wool Research Institute Avikanagar, Distt. Tonk	:	Member
13	Sh. K. P. Sharma Assistant Administrative Officer N.R.C.C.	:	Member Secretary

Research Advisory Committee (RAC)

The compositions of the RAC (w.e.f. May, 10, 2005) is as follows :

1	Prof. Nagendra Sharma Vice-Chancellor, Sher-e-Kashmir University of Agriculture Technology, Jammu	:	Chairman
2	Dr. B. C. Patnayak Ex. Director, CSWRI S-30, Maitri Vihar (Phase-I) Chandrasekharpur Bhubaneswar-751023, Orissa	:	Member
3	Dr. N. D. Khanna Ex- Director NRC on Camel Flat No. 901, Sector 9, Multi Storey Building, Malviya Nagar, Jaipur- 302017	:	Member
4	Sh. Lalan Tiwari Nagar Nigam Bhawan No. 1 Near Railway Station, Gorakhpur	:	Member
5	Director NRCC, Bikaner	:	Member
6	Assistant Director General (AN&P) Indian Council of Agricultural Research, Krishi Bhawan New Delhi	:	Member
7	Dr. A. K. Gehlot Dean CVAS, Bikaner	:	Member
8	Dr. J. S. Bhatia Ex-ADG , ICAR Apollo College of Veterinary Medicine Agra Road Jaipur	:	Member
9	Sh. Partap Singh VPO, Bithia Via Sumerpur Distt. Pali (Raj.)	:	Member
10	Dr. Aminu Deen, PS NRC on Camel, Bikaner	:	Member Secretary

The Second meeting of RAC was held on 24-25 June 2006. Prof. Nagendra Sharma, Vice-Chancellor and Chairman, RAC, Dr. M.S. Sahani, Director, NRCC, Dr. O.P. Dhanda, ADG (AN&P), Dr. B.C. Patnayak, Ex-Director, CSWRI, Dr. N.D. Khanna, Ex-Director, NRCC and Dr. Aminu Deen, PS and Shri Pratap Singh were present in the meeting. Proceedings of RAC were finalized and sent to Council for approval. Council approved the major programmes with minor modifications.

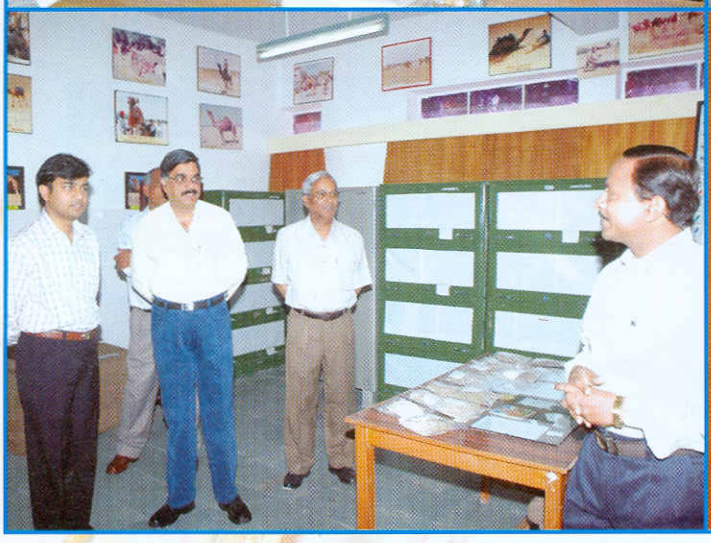
Institute Research Committee (IRC)

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 on going research projects periodically. Annual IRC meeting for the year 2006-07 was held on 25-26 May, 2007 under the chairmanship of Prof. K.M.L. Pathak, Director. Experts including Dr. M.S. Sahani, Former Director, NRCC, Dr. Arun Verma, Former- ADG, Dr. A.K. Mishra, PS, IVRI, Dr. A.K. Gehlot, Dean, CVAS, Bikaner, Dr. S.B.S. Yadav, Director Research (VAS), RAU, Dr. S.K. Kashyap, Associate Professor, CVAS, Br. (Dr.) N.M. Singhvi, VSM and Dr. S.K. Sharma, Deputy-Director, RAU, Bikaner participated. Important recommendations were made after the presentation of each project. Progress of the on going research projects were discussed and 17 new projects were approved.


AL RESEARCH CENTRE ON CAMEL


RESEARCH CENTRE ON CAMEL




AL RESEARCH CENTRE ON CAMEL

10

Participation in Conferences, Meetings, Workshops, Symposia and Trainings

Name of the participants	Name of Trainings/ Seminar/ Symposia/ Conference	Period
Dr. K.M.L. Pathak, Director	Third International conference on linking marketing of farmers, India, China and American Institute and University of Illinois, New Delhi.	12 -13 March, 2007
Dr. M.S. Sahani, Director	Science Congress at Jodhpur	30-31 July, 2006
	राजभाषा प्रबंधन, नीति कार्यान्वयन, कार्यशाला संचालन, सूचना प्रौद्योगिकी एवं कम्प्यूटरीकरण, held at Solan, Himachal Pradesh.	26- 28 April, 2006
Dr. Aminu Deen Pr. Scientist	International Camel Conference, RAU, Bikaner	16-17 Feb. 2007
Dr. A.K. Nagpal Sr. Scientist	International Camel Conference, RAU, Bikaner.	16-17 Feb. 2007
Dr. A. K. Roy Sr. Scientist	International Camel Conference, RAU, Bikaner.	16-17 Feb. 2007
	ASCAD symposium on strengthening of disease diagnostic facilities for sustainable livestock and poultry development organized by the Regional Disease Diagnostic Centre, Department of Animal Husbandry, Udaipur	10-11 March, 2007
Dr. S.K. Dixit Sr. Scientist	International Camel Conference, RAU, Bikaner.	16 - 17 Feb, 2007

Dr. S.C. Mehta Sr. Scientist	Workshop on Real Time PCR and DNA Sequencing Technology, Lab India Instruments Pvt. Ltd, Gurgaon.	19 - 20 July, 2006
	International Camel Conference, RAU, Bikaner.	16- 17 Feb. 2007
Dr. Gorakh Mal Sr. Secietist	International Camel Conference, RAU, Bikaner.	16- 17 Feb. 2007
Dr. F.C. Tuteja Sr. Scientist	Reviving Rajasthan Camel Husbandry for income generation and sustainable land use, Lokhit Pashu Palak Sansthan- NGO, Jaisalmer.	6-8 Nov., 2006
	Hindi Workshop at NBAGR, Karnal	4-8 Sept. 2006
	राजभाषा प्रबंधन, नीति कार्यान्वयन, कार्यशाला संचालन, सूचना प्रौद्योगिकी एवं कम्प्यूटरीकरण, held at Solan, Himachal Pradesh.	26- 28 April, 2006
	Science Congress at Jodhpur	30-31 July, 2006
Dr. G. Nagrajan Scientist	IV Annual conference of BSI (Biotech-2006) (CCMB), Hyderabad	26-28 Nov. 2006
Dr. Raghvendar Singh, Sr. Scientist	International Camel Conference, RAU, Bikaner.	16- 17 Feb. 2007
Dr. U.K. Bissa, T-9	International Camel Conference, RAU, Bikaner.	16- 17 Feb. 2007
Mrs. D.S. Sena (Sr. Scale)	International Camel Conference, RAU, Bikaner.	16-17 Feb. 2007
	ASCAD symposium on strengthening of disease diagnostic facilities for sustainable livestock and poultry development RDDL, Udaipur.	10-11 March 2007
Mrs. N. Saini (Sr. Scale)	Reviving Rajasthan Camel Husbandry for income generation and sustainable land use, Lokhit Pashu Palak Sansthan- NGO, Jaisalmer.	6-8 Nov. 2006
	International Camel Conference, RAU, Bikaner.	16-17 Feb. 2007
Sh. Ram Dayal Raiger, T-6	National Conference on Information Management in Digital Libraries (NCIMDiL), Central Library, Indian Institute of Technology, Kharagpur	2-4 August 2006
	Hindi Computer Training, Dept. of Official Language, Ministry of Home Affairs (Govt. of India), organized by C-DAC, Noida, held at Small Industries Service Institute, Jaipur	24-28 July, 2006
	Hindi Workshop, National Research Centre on Camel, Bikaner	6-7 July 2006
Sh. Dinesh Munjal, T-6	राजभाषा प्रबंधन, नीति कार्यान्वयन, कार्यशाला संचालन, सूचना प्रौद्योगिकी एवं कम्प्यूटरीकरण held at Solan, Himachal Pradesh.	26- 28 April, 2006
	Workshop for Nodal officer on PERMISNET and Intelligent Reporting System, IASRI, New Delhi	21 July 2006

Human Resource Development

Dr. (Mrs.) D. Suchitra Sena	Computer based Multimedia Presentation, NAARM, Hyderabad	July 14 to August, 3, 2006

11

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

Training

1. One month orientation for graduate students of Biotechnology, Microbiology, Engineering and related fields.
2. Two, three and four months dissertation work for post graduate students of different disciplines.

Brain storming session

In order to prioritize major researchable issues of NRCC for XIth Plan, a Brain Storming Meet was organized on March 24, 2007. A large number of subject matter specialists from RAU, Bikaner, SKDAU, Dantiwada, CCSHAU, Hisar, NBAGR, Karnal, CSWRI regional station, Bikaner, NRCE, Regional station, Bikaner and Animal Husbandry Department of Rajasthan Government participated in this meet.

Dr. S.S. Rathore, Dean, Apollo College of Veterinary Medicine, Jaipur presided over the inaugural session. Dr. J.S. Bhatia, former ADG and Dr. Gurmej Singh, Director, NBAGR, Karnal graced the occasion as guests of honour. In his welcome address, Professor K.M.L. Pathak, Director, NRCC elaborated the activities of the Centre and emphasized the need of providing joint efforts by the universities, ICAR institutes and line department of camel inhabiting states for developing a strategic plan to address the declining population of camel and its sustainability in rural economy. In-charges of scientific units of NRCC viz. Dr. Aminu Deen, Dr. G.P. Singh, Dr. S.K. Ghorui and Dr. S.C. Mehta presented the SWOT analysis of the issues. The important issues like camel neuro-endocrinology, cameline immunoglobulins, selection of camel for higher milk production, therapeutic utility of camel milk, value added milk products, epidemiological survey of camel diseases, role of camel in eco-tourism and conservation of double humped camel were discussed under major themes and finalized in the plenary session. A special

session was organized on scientists-farmers interaction wherein prominent pastoralists participated. The plenary session was chaired by Dr. Anil Kumar, Dean PGS, RAU, Bikaner. Dr. Veer Singh of SKDAU, Dantiwada and Dr. D.K.Sadana of NBAGR, Karnal were special guests. Dr. S.C. Mehta, In- charge Technical cell coordinated the meet.

Distinguished Visitors

1. Professor R. Yagil from Israel visited on August 19, 2006.
2. Dr. R. P. Bajpai, Vice-Chancellor, Guru Jambeshwar University, Hisar visited on December 19, 2006.
3. Dr. C.B. Gena, Vice-Chancellor, Bikaner University, Bikaner visited on February, 13, 2007,
4. Dr. Theib Oweis, Director, ICARDA, Syria visited on March 24, 2007.

Joining, Transfer and Retirements

1. Prof. K.M.L. Pathak, joined as Director of National Research Centre on Camel, Bikaner on 13th December, 2006.
2. Dr. M.S. Sahani, Director, NRCC, Bikaner retired on 31st August, 2006.
3. Dr. Sumant Vyas, Senior Scientist was deputed to undertake Post Doctoral studies in Institute National de la Recherche Agronomique, Physilogie Reproduction et comportments 37380, Nouzilly, France.

12

Personnel

Director

Dr. M. S. Sahani, Director (Up to 31-08-2006)
Dr. G.P. Singh (Actg.) (Up to 31-8-06 to 12-12-2006)
Prof. K.M.L. Pathak, Director (Since 13.12.2006)

Principal Scientist

Dr. G. P. Singh, Animal Nutrition
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. R. Singh, Animal Biochemistry
Dr. S. C. Mehta, Animal Genetics and Breeding
Dr. F. C. Tuteja, Veterinary Medicine
Dr. Gorakh Mal, Animal Biochemistry

Scientist Sr. Scale

Dr. Champak Bhakat, Livestock Production Management
Dr.(Mrs.) D. Suchitra Sena, Veterinary Medicine
Dr.(Mrs.) Nirmala Saini, Animal Nutrition

Scientist

Dr. S. K. Nagrajan, Animal Biotechnology

Technical

Dr. U. K. Bissa, Sr. Veterinary Officer, T-9
Dr. N. Sharma, LFS, 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 (on study leave)
Sh. Nand Kishor, Technical Officer, T-5

Administration

Sh. Satyapal, Assistant Finance & Account Officer
Sh. K. P. Sharma, Assistant Administrative Officer

13

Infrastructure Development

Administrative-cum-Library Building: Administrative cum library building was completed and inaugurated on 26th February 2007. Dr. Mangla Rai, Director General, Indian Council of Agriculture Research and Secretary, Department of Agriculture Research and Education, Government of India, New Delhi inaugurated the new Administrative cum library building. Director's cell, Administrative office, Library and Agricultural Research and Information System Cell were shifted from laboratory building to new building.

Extension of camel museum: Existing camel museum was extended for the benefits of visitors, dignitaries and tourists incorporating all relevant information about camel breeds, camel products, utility of camel, feeds and fodders utilized by camel and highlights of research work

accomplished at the centre, which offers a visual documentary of cultural, ethical, social, economical and scientific aspects of camel. It possesses the specimens of various utility products made out of camel bones and hide. There is pictorial and iconological depiction of role of camel in history and mythology.

Camel health laboratory: Construction work for new pathology laboratory was completed, which will be used for developing diagnostic facilities for sick animals and necropsy investigations of died camels.

Camel milk parlor: A milk parlor was established, where fermented and flavored camel milk, tea and coffee prepared from camel milk are sold.

Community center: A spacious community centre has been constructed for organizing academic, cultural and other creative activities. Presently it is being furnished.

Generator of 160 K.V.A. installed: For un-interrupted and automatic resumption of electricity during power cut was installed at the Centre.

New Gate with approach road : New gate at the entrance of ADM building was constructed along with pucca road.

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र में राजभाषा के प्रयोग और क्रियान्वयन में प्रगति

केन्द्र में अनुसंधान कार्यों के साथ-साथ राजभाषा नीति क्रियान्वयन व इसके प्रचार-प्रसार पर पर्याप्त जोर दिया जाता है। इसी निर्धारित लक्ष्य को ध्यान में रखते हुए वर्ष के दौरान विभिन्न कार्यक्रम व गतिविधियों का आयोजन रखा गया तथा उपलब्धियाँ प्राप्त की गई जिनका विवरण निम्नवत् है :-

राजभाषा का प्रथम पुरस्कार

राजभाषा संस्थान, नई दिल्ली द्वारा दिनांक 26-28 अप्रैल, 2006 को सोलन (हि.प्र.) में आयोजित विशेष हिन्दी कार्यशाला एवं संगोष्ठी में केन्द्र द्वारा राजभाषा में विज्ञान प्रचार-प्रसार कार्यों सम्बन्धि आलेख प्रस्तुत किया गया। साथ ही राजभाषा प्रचार-प्रसार कार्यों के संबंध में एक प्रतिवेदन प्रस्तुत किया गया। संस्थान द्वारा केन्द्र को कार्यालय में हिन्दी के प्रयोग के लिए उल्लेखनीय योगदान हेतु प्रथम पुरस्कार के रूप में पुरस्कृत किया गया। साथ ही आलेख प्रस्तुतिकरण हेतु द्वितीय पुरस्कार भी प्रदान किया गया। इस अवसर पर देशभर के लगभग 55 कार्यालयों/विभागों/संस्थानों ने भाग लिया जिनमें मुख्य रूप से लोकसभा व राज्यसभा सचिवालय, नई दिल्ली, आयुध निर्माणी, भंडारा, महानगर, दूरसंचार निगम लि. मुम्बई, कार्यालय महाप्रबंधक (वित्त) डाकलेखा, नई दिल्ली, राष्ट्रीय अपराधशास्त्र एवं विधि विज्ञान संस्थान, नई दिल्ली तथा हिन्दुस्तान एरोनाटिक्स लि., बैंगलूर आदि शामिल रहे।

नगर राजभाषा चल वैजयंती

नगर राजभाषा कार्यान्वयन समिति, बीकानेर की वर्ष 2006 की दिनांक 29.06.2006 को प्रथम अर्द्धवार्षिक बैठक में केन्द्र को वर्ष 2005-06 में राजभाषा के उत्कृष्ट व सर्वाधिक प्रयोग के लिए राजभाषा चल वैजयंती प्रदान की गई। यह शील्ड

अपर मंडल रेल प्रबंधक श्रीमान् आर.के.अटोलिया के कर कमलों द्वारा केन्द्र निदेशक डॉ. मोहन सिंह साहनी को सौंपी गई। उन्होंने केन्द्र को दूसरी बार यह शील्ड प्राप्ति पर बधाई देते हुए उपस्थित सदस्यों से कहा कि राजभाषा हिन्दी को अधिकाधिक प्रयोग में लें।

राजभाषा कार्यशाला (6-7 जुलाई, 2006)

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र में दिनांक 6-7 जुलाई, 2006 के दौरान नगर स्तरीय राजभाषा कार्यशाला का आयोजन रखा गया। दो दिवसीय कार्यशाला के प्रथम सत्र में डॉ. ब्रजरतन जोशी, व्याख्याता, रामपुरिया महाविद्यालय, बीकानेर द्वारा 'देवनागरी लिपि की वैज्ञानिकता व इसका मानकीकरण' विषयक व्याख्यान दिया गया। अपने व्याख्यान में डॉ. जोशी ने

बताया कि हिन्दी विश्व की सबसे अधिक वैज्ञानिकता वाली भाषा है तथा आज यह बड़ी तेजी से कम्प्यूटर भाषा के रूप में उभर रही है। कार्यशाला का 'राजभाषा प्रबंधन एवं नीति कार्यान्वयन' विषयक दूसरा व्याख्यान श्रीमान हरीश चन्द्र जोशी, निदेशक (राजभाषा), भारतीय कृषि अनुसंधान परिषद, नई दिल्ली द्वारा दिया गया। डॉ. जोशी ने उपर्युक्त संदर्भ में विस्तार पूर्वक प्रकाश डाला। उन्होंने कहा कि सर्वप्रथम हमें अपने उद्देश्य का निर्धारण करना है तथा पूर्ण उत्साह के साथ इसकी पूर्ति हेतु कार्य करना है। प्रथम दिवस के अन्तिम सत्र में डॉ. भगवान दास किराडू, प्राचार्य, नेहरू शारदा पीठ महाविद्यालय, बीकानेर द्वारा 'हिन्दी लेखन व इसकी महत्ता' पर व्याख्यान दिया गया। डॉ. किराडू ने हिन्दी भाषा के प्रयोग के दौरान प्रयुक्त की जाने वाली सामान्य अशुद्धियों (शब्द/वाक्य, विशेषण, उपसर्ग एवं प्रत्यय आदि) को सभाकक्ष के समक्ष रखा। कार्यशाला के एक अन्य व्याख्यान 'विज्ञान के प्रचार-प्रसार में राजभाषा की सहभागिता' में डॉ. डी.डी.ओझा, सदस्य, संयुक्त हिन्दी सलाहकार समिति, पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय, जोधपुर ने देश में हिन्दी के माध्यम से विज्ञान की विकास की यात्रा को क्रमबद्ध रूप में प्रस्तुत किया। कार्यशाला का अन्तिम सत्र 'राजभाषा की दशा व दिशा' पर रखा गया जिसमें प्रतिभागियों ने राजभाषा स्थिति सम्बन्धि महत्वपूर्ण पहलुओं पर परस्पर चर्चा की।

कार्यशाला का समापन समारोह में केन्द्र की लघु पुस्तिकाओं क्रमशः 'उष्ट्र दुग्ध त्वचा क्रीम' व 'मधुमेह रोग में उष्ट्र दूध की उपयोगिता' का विमोचन किया गया।

राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर में दिनांक 14-28 सितम्बर, 2006 तक हिन्दी पखवाड़ा मनाया गया। केन्द्र के कार्यवाहक निदेशक डॉ. जी.पी.सिंह द्वारा विधिवत् रूप से हिन्दी पखवाड़े का शुभारम्भ किया गया। पखवाड़े के शुभारम्भ पर केन्द्र के वैज्ञानिकों/अधिकारियों/कर्मचारियों से अधिकाधिक सरकारी कामकाज हिन्दी में करने के लिए संकल्प-पत्र भरवाए गए तथा एक अपील भी जारी की गई। हिन्दी पखवाड़ा, 2006 के दौरान केन्द्र में आयोजित निम्नलिखित कार्यक्रमों/गतिविधियों में वैज्ञानिकों/अधिकारियों/कर्मचारियों ने उत्साहपूर्वक भाग लिया :-

1. हिन्दी में शोध-पत्र पोस्टर प्रदर्शन प्रतियोगिता
2. हिन्दी में सामान्य ज्ञान प्रश्नोत्तरी प्रतियोगिता
3. हिन्दी में निबंध लेखन प्रतियोगिता
4. राजभाषा कार्यशाला

हिन्दी पखवाड़ा, 2006 के समापन समारोह के अवसर पर मुख्य अतिथि के रूप में पधारे जनकवि श्रीमान हरीश भादाणी, बीकानेर ने अपने उद्‌बोधन में कहा कि भाषा के साथ समाज व हमारे मनोवैज्ञानिक विकास को देखना होगा। यद्यपि हम भाषाई दृष्टि से एक राष्ट्र नहीं रहे परंतु संस्कृति के रूप में हम एक राष्ट्र के रूप में सदा रहे हैं। विशिष्ट अतिथि के रूप में आमंत्रित श्रीमान नरेन्द्र शर्मा, वरिष्ठ साहित्यकार, बीकानेर ने

कहा कि भाषा का समाज से सीधा सम्बन्ध है। उन्होंने कहा कि कोई भी भाषा ऐसी नहीं जिसमें किसी भी भाषा का मिश्रण नहीं पाया जाता है। अध्यक्ष के रूप में केन्द्र के कार्यकारी निदेशक डॉ. जी.पी.सिंह ने सभा को सम्बोधित करते हुए कहा कि हिन्दी एक ऐसी भाषा है जो देश को जोड़ती है।

समापन समारोह के अवसर पर मुख्य अतिथि जनकवि श्रीमान हरीश भादाणी के कर-कमलों द्वारा केन्द्र की राजभाषा पत्रिका 'करभ' के चतुर्थ अंक का लोकार्पण किया गया। साथ ही हिन्दी पखवाड़ा, 2006 के दौरान आयोजित विभिन्न प्रतियोगिताओं में विजेता रहे प्रतिभागियों को पुरस्कृत किया गया।

केन्द्र के हिन्दी प्रकाशन

1. राजभाषा वार्षिक पत्रिका ''करभ'' (चतुर्थ अंक)
2. ऊँट की मिंगनी : विश्लेषण व खाद के रूप में इसकी उपयोगिता (द्विभाषी)
3. मधुमेह रोग में उष्ट्र दूध की उपयोगिता (द्विभाषी)
4. उष्ट्र दुग्ध त्वचा क्रीम (द्विभाषी)
5. उष्ट्र के वीर्य परीक्षण की बाधाएँ (द्विभाषी)
6. वार्षिक प्रतिवेदन - सारांश हिन्दी में

उद्घाटन समारोह

हिन्दी पखवाड़ा

CAMEL MILK ICE CREAM


राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर
प्रशासनिक एवं पुस्तकालय भवन का
उद्घाटन समारोह


हिन्दी पखवाड़ा
दिनांक : 14-28 सितम्बर 2006
राष्ट्रीय उष्ट्र अनुसंधान केन्द्र, बीकानेर


CAMEL MILK ICE CREAM