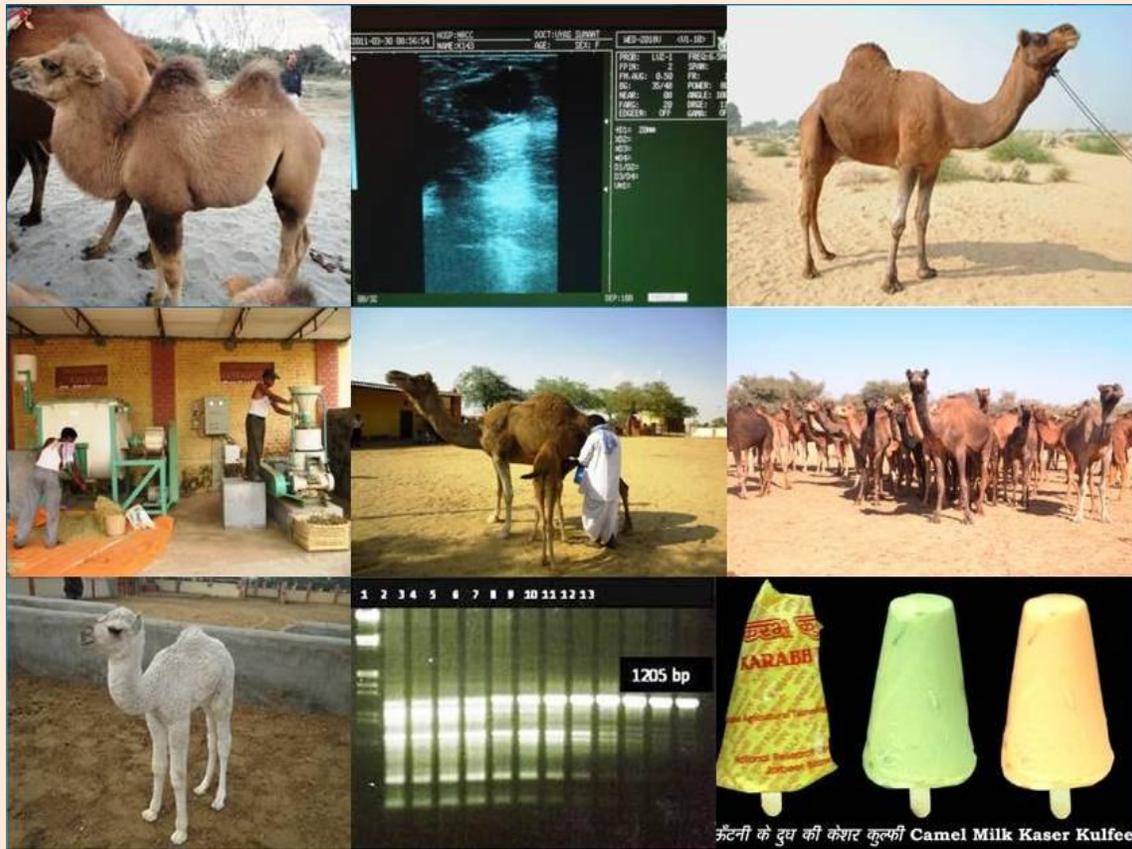


Camel Research (1986-2013)-NRC on Camel

Editors: S. Vyas, A.K. Sharma and N.V. Patil



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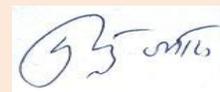
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Preface

During a train journey from Bikaner to New Delhi in winters of 2012-13, I met Mr Anurag Acharya, founder and Principal Scientist of Google Scholar. He complained that though Indian scientists have produced good research work but most of the work being published in Indian Journals is not available to the global research fraternity and hence quality cannot be judged on global scale. His words kept on disturbing me because it is true that unless the research findings are available to other researchers they cannot be put on trial for their repetitive value, an essential criterion for the research findings to be declared useful for end user (in our case the farmer). The lack of widespread dissemination of research findings can also hamper the due recognition for novelty of the research results. Further in the present era of IPR the word “idea patent” can be tackled only by making available the research done in public domain. This was the genesis for preparing the present book of abstracts of research papers published (from 1986 to 2013) out of work done on camel at National Research Centre on Camel, Bikaner, an institute under aegis of Indian Council of Agricultural Research. Majority of the work was done on *Camelus dromedarius* (single humped camel) with few papers on *Camelus bactrianus* (double hump camel).

Apart from Centre’s Library the libraries of College of Veterinary and Animal Science, Bikaner, National Dairy Research Institute, Karnal and Indian Veterinary Research Institute, Izatnagar were consulted. It took almost one year to complete this book. A total number of 272 abstracts are presented in chronological order. A list of research papers (96) published without summary or abstracts has been placed in the end. Apart from limited print copies the book will also be made available on internet. This will save the cost of printing of many copies for distribution and will aid to conserve the environment by saving paper. The page setting has been done in the manner to enable it to be searched easily by popular search engines like Google scholar. The web link of the book will also be provided to the international agencies working on camel like ISOCARD (International Society of Camelid Research and Development), CIRAD-EMVT, France so that most of the camel researchers can have access to this book. I am hopeful that this book will become important reference book for the camel researchers and students globally.

I express my warm regards and sincere thanks to Prof. K.M.L. Pathak, Deputy Director General (AS), Indian Council of Agricultural Research for his constant motivation and encouragement. I extend my gratitude to Dr B.S. Prakash, Assistant Director General (AN&P), ICAR for his ingenious advice. I express my gratitude to Dr N.V. Patil, Director, National Research Centre on Camel, Bikaner for providing necessary infrastructure and resources to complete this book. This work would not have been possible without his sagacious guidance, immense help and care. I also thank the help by another co-editor of the book, A.K. Sharma, Research Associate, ITMU, NRC on Camel, Bikaner.



(Sumant Vyas)
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List of research papers (with abstracts/summary)

1986

1. Agarwal S.P., Khanna N.D., Agarwal V.K. and Dwaraknath P.K. (1986). Thyroidal status of male camel (*Camelus dromedarius*) during breeding and non-breeding seasons. Indian Journal of Animal Sciences 56(10):1036-1038.

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Thyroidal status of male camel during breeding and non-breeding seasons

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Abstract

Blood samples from 16 male camels of varying ages were collected during rutting and non-rutting seasons. Sera were analysed for thyroxine (T₄) and tri-iodothyronine (T₃) by radioimmunoassay technique. In general, the thyroid hormone level in camel was higher than that of other species. The levels of both T₄ and T₃ were significantly higher during non-breeding season than the rutting season, but T₄: T₃ ratio was almost double during rutting season. There was no spectacular effect of age on thyroid hormone levels.



Profiles of steroid hormones in male camel

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Abstract

Blood samples from 16 dromedary male camels of different age groups were collected during rutting and non-rutting seasons. The levels of testosterone, oestradiol-17 β and progesterone in sera increased with age, particularly during breeding season. The levels of all the 3 hormones were higher during rutting season, but significant differences were observed after 4 years of age. The effect of age and season was most spectacular in animals above 8 years of age, indicating age of full maturity and threshold levels for rut in male camel.



Circulating levels of estrogen and progesterone in female camel (*Camelus dromedarius*) during pregnancy

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Abstract

Monthly blood sample from 16 pregnant camel were collected commencing from 60 d post service until the last month of gestation. Two animals aborted and two did not conceive. The average length of gestation was 398 ± 13 and 372 ± 11 d in camels carrying male and female fetus, respectively, with a mean of 383 ± 9 d. Sera were analysed for estradiol-17 beta and progesterone by radioimmunoassay. The mean estradiol levels increased progressively from a basal level of 20 pg/ml at 2 to 3 mo of pregnancy to about 450 pg/ml at the final stages of gestation. The camel bearing a male fetus had relatively lower estradiol concentration (76.5 ± 10.8 pg/ml) as compared to those carrying a female fetus (112.3 ± 19.6 pg/ml). The mean progesterone levels fluctuated between 4 and 5 ng/ml throughout pregnancy except for a slightly lower value (2.5 ± 0.27) at 9 to 10 mo of gestation. On an average, the camels carrying a male fetus had higher progesterone levels (5.13 ± 0.69 ng/ml) than those carrying a female fetus (3.45 ± 0.20). The data suggested that the steroid hormone levels are influenced by the stage and sex of the fetus. Cases of abortion and unsuccessful conception could be identified.

Keywords: Camel, estrogen, progesterone, pregnancy



Genetic studies on birth weight of camel calves of Bikaneri breed

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Abstract

Data on birth weight of 522 camel calves of Bikaneri breed were analysed for conducting genetic studies. The data were classified according to period (year-wise, 1961-80), parities (first to fifth parity) and sex. The results indicated that all the 3 factors had significant effect. The average birth weight of male calves was 41.95 ± 7.7 kg and that of female calves 39.97 ± 5.32 kg. The overall mean average birth weight was 41.02 ± 0.20 kg. The calves born to dams in first parity were lightest (38.84 ± 5.19 kg), while heaviest (44.39 ± 5.47 kg) were born to dams in fifth parity. The heritability and correlations were computed by parental halfsib correlation method after correcting data for significant nongenetic effects. The heritability of birth weight was 0.5666 ± 0.1940 ; genetic and phenotypic correlations with gestation period were -0.2389 ± 0.2125 and 0.0136 ± 0.0523 respectively.



Serum estrogen and progesterone levels in camel (*Camels dromedaries*) during estrous cycle

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Abstract

Sera samples from three female camels were analysed for estrogen and progesterone during estrus cycle. The estradiol levels varied between 2 and 12 pg/ml with a moderate peak, at estrus followed by secondary-peaks. The progesterone levels were constantly low (below 1 ng/ml) in one camel indicating anovulatory heat. Two camels exhibited a mid cycle peak (8-14 ng/ml) with low values at the beginning and the end of cycle suggesting ovulation and corpus luteum formation but failure of conception. Thus monitoring of steroid hormones during, estrous cycle could be of significance in exploring the true reproductive status of the animals.



Circulating concentration of thyroid hormones in pregnant camels (*Camelus dromedaries*)

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Abstract

Blood samples from 16 female camels were collected at monthly intervals commencing from 60d post breeding until the last month of gestation. Two camels failed to conceive and two had unnoticed abortions. The average gestation period was 398 ± 13 and 372 ± 11 in camels bearing male and female fetus, respectively, with an overall mean of 383 ± 9 d. Sera were analyzed for thyroxine (T_4) and triiodothyronine (T_3) by radioimmunoassay. Mean T_4 and T_3 concentrations varied from 76 to 116 ng/ml and 0.73 to 1.32 ng/ml, respectively, during various stages of gestation. In general, the T_4 and T_3 levels were higher during early pregnancy, with lowest values in the tenth month. $T_4:T_3$ ratio showed minor, nonsignificant fluctuations. Age of dam or sex of fetus had no effect on hormone levels. Similarly, hormone levels were not affected by failure of conception or by abortion.

Keywords: camel, thyroxine, triiodothyronine, pregnancy



Population trends and distribution of camel population in India

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Abstract

India ranks third in camel population in the world. In 1985 India had 6.30% of the 17.4 million world camel population. There had been steady increase in camel population during the last 4 decades. Increase (68.20%) from 0.65 million in 1945 to 1.1 million in 1985 was recorded. Camel density in the country was 0.37/km², Rajasthan state alone accounted for 70.1% of Indian camel population, followed by Haryana 11.2% Gujarat 6.9% and Punjab 5.9%. Camel density and camel population were highest in 11 arid districts of Rajasthan. The camel density in this arid area was 3.06/km² and 4.78/100 persons and contributed 9.92% towards total domestic herbivore livestock biomass. The camel density in Rajasthan, Haryana, Gujarat and Punjab was 2.25, 0.36, 2.78 and 1.27/km² respectively. Evidence indicates presence of camels in India circa 2800 BC.



Camels in India from proto-historic to the present times

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Abstract

Information on the presence and utility of camels in India from proto-historic period to the present is supported by archaeological evidences, literature, arts, numismatics, religious and social aspects. The camel in India has been an animal of utility from early Harappan level of civilization (c.3000-1800 BC). One school believed that the single-humped camel was independently domesticated by the Indus people, while others were of the opinion that the domesticated double-humped camel was the species present in the Indus Valley during third millennium BC. Due to the absence of detailed analysis of bones excavated from archaeological sites, it is difficult to reach some conclusive identification regarding the species level of the ancient Indian camel. Presently, the bactrian camel is on the verge of extinction from this country, while the dromedary with a population of 1.1 m is an important domesticated animal widely distributed over the north-western parts of India, playing important role in the social and economic life of the people.



Breeding parameters of Indian camels

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Abstract

Indian camel population is third highest in the world. Of the 1.1 m population, 70% camels are found in Rajasthan. There are 4 main camel breeds, viz. Bikaneri, Jaisalmeri, Kutchi and Mewari. The breeding season of camels is November through March. The age at first service was 1390 ± 25 days, although it can be reduced to 2 to 3 years with better management practices and genetic improvement. The average age at first calving was 1882 ± 28.69 days. Seasonality in breeding was observed 92% of calvings occurred from December through March. The average gestation length was 389.3 ± 0.0781 days with heritability 0.703 ± 0.2087 . Average birth weight of calves in the Bikaneri breed was 41.02 ± 0.1940 kg. The birth weight increased from first to fifth parity. Dam's weight in the last month of pregnancy exhibited positive correlation with the birth weight. Breed differences were observed in the birth weight, body weights, biometrical characters and growth pattern. Heart girth had significant correlation with body weights at different age groups. Average inter-calving period was 771.66 ± 8.08 days. Milk production varied from 3.8 to 10.8 kg/day. High mortality risk age group was from birth to 3 months of age and period from May through July as high mortality risk months. Karyotyping studies confirmed 37 pairs of chromosomes in the Indian camel. Polymorphism in several blood proteins and enzymes was observed indicating innate genetic variability.



Serum progesterone levels in female camels during oestrous cycle

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Abstract

Blood samples from 6 female camels in oestrus were collected on 2 successive days of mating and then on alternate days till day 22 post-mating. Sera samples were analysed for progesterone concentration by RIA. Three different patterns of progesterone profiles were observed. In 2 camels, basal levels persisted throughout the cycle. Two camels exhibited a short peak on day 9 preceded and followed by basal levels. In 2 camels the peak levels persisted till 22 days. These patterns depicted anovulatory, ovulatory but infertile and fertile oestrous cycles respectively. The results suggested that progesterone monitoring during oestrous cycle revealed true reproductive status of the animal at an early stage.



Cortisol response of male camel (*Camelus dromedarius*) under different types of work load

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Abstract

Dromedary camels of Bikaneri breed were given exercise in the form of riding and haulage in a two wheel and four wheel cart with a payload of 1500 and 2500 kg, respectively for 3 to 4 hr. Blood samples were collected just before start of exercise, at hourly interval during exercise and at 2, 4, 8 and 24 hr of rest. Samples from control (non-exercised camels) were collected at periods corresponding to exercised animals. Sera were analysed for cortisol by RIA using antibody coated tubes. The results showed basal levels to vary between 6 and 11 ng/ml which progressively increased during exercise to attain a peak value of around 25 ng/ml in all types of exercises. The levels returned to basal value after 2 to 4 hr of rest. The enhanced cortisol secretion might be controlling metabolic functions to meet energy requirements and to maintain homeostasis during draft exercise

Keywords: Camel, draft, cortisol



Effect of mating on hormone levels in male camels (*Camelus Dromedarius*)

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Abstract

Blood samples from four stud camels of Bikaneri, Kutchi and Arabi breeds were collected before and after mating. Sera were analysed for testosterone, cortisol, thyroxine (T₄) and triiodothyronine (T₃) using specific RIA Kits. The testosterone levels were higher in the Arabi and Kutchi camels as compared to the Bikaneri animals. The basal cortisol levels were within 5 to 12 ng/ml. Both these hormone levels were conspicuously elevated in samples collected after mating. The results indicated the individual differences and steroidogenic effect of mating in camels. No effect of mating was observed in the levels of thyroid hormones, although serum thyroxine levels were lower in Arabi than the animals belonging to the Kutchi and Bikaneri breed.



Camel rearing in the Indian arid zone

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Abstract

With about 6.3% of the world camel population, India ranks third after Somalia and Sudan in this respect. According to the Livestock Census (1982), Rajasthan State alone accounted for 70% of India's total camel population, of which 84.5% was found in its 11 western arid districts. The camel density in these 11 districts was 3.06 per sq km and 4.78 per 100 persons contributing 9.9% towards the total domestic herbivore livestock. The augmentation of camel rearing has a strong case in the Indian arid zone. The camel has great adaptive mechanisms and is well suited for life in the desert. The major camel resources are energetics, milk, meat, hair and hide. It is necessary that untapped potentials of camels are explored scientifically to make camel rearing an economically viable proposition in terms of the social and agroecological aspects of livestock management and for providing sustainable subsistence to the people inhabiting Indian arid region.



Induction of early puberty in female camels

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Abstract

Prepubertal female camels (9) were injected with 1000 and 2000 IU of folligon for 2 or 3 consecutive days; 3 saline treated animals served as control. Oestrus was induced in all the treated animals 3 to 5 days post-treatment and all were successfully mated. In the treated group 4 animals settled after first service: the rest conceived subsequently on repeated matings. Five animals carried pregnancy up to full term. The elevated progesterone level (8-12 ng/ml) in the conceived animals was maintained up to 22 days post-mating. The progesterone level remained low throughout the cycle in anovulatory heats (≤ 1 ng/ml). However, in the controls, progesterone level persisted at the basal level. The gestation length for the treated animals was 382.6 ± 6.31 days against the herd average of 379.3 ± 3.46 days. The average birth weight of the calves born out of the treated heifers was lower than the herd average.



Effect of feeding *Leucaena leucocephala* with *Phaseolus aconitifolius* on growth and thyroid status of camel calves

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Abstract

Dried leaves of *Leucaena leucocephala* locally called subabool was mixed @ 20 and 40 % with dried fodder of *Phaseolus aconitifolius*, locally called moth chara. Two feeding trials were conducted on camel calves of Bikaneri breed (1 to 3 years old) for 4 and 6 months, respectively, under 20 and 40 % subabool in ration. The growth performance and thyroid status of the calves were compared with the controls maintained only on moth chara.

Subabool fodder after initial rejection was readily consumed within 6-7 days. The dry-matter consumption was 1.99 ± 0.13 kg and 2.03 ± 0.04 kg per 100 kg live weight per day and average daily weight gain of 330.6 ± 24.67 and 258.3 ± 27.57 g under 20% and 40% subabool ration, respectively, the feed conversion efficiency decreased with increasing level of subabool in ration.

Incorporation of 40% subabool with moth chara increased CP, EE, CF and ash content but slightly decreased NFE and TDN. The intake of dry matter, digestible crude protein, total digestible nutrients and metabolizable energy were 21.6, 84.6, 11.4 and 14.5% higher, respectively, as compared to control. There was improvement in the digestibility coefficients of crude protein and crude fibre and depression in dry matter digestibility and NFE.

The levels of T_3 and T_4 in the serum of calves were, respectively, 2.2 ± 0.09 and 83.6 ± 3.41 (ng/ml) in controls and 2.3 ± 0.09 and 77.8 ± 5.55 (ng/ml) under 40% subabool ration. In general the ratio of T_4 and T_3 was wider in the control calves. Subabool up to 40% in the camel ration depressed feed conversion efficiency, and apparently did not exhibit any adverse influence on palatability, growth performance, thyroid status, hair and general health of camel calves.



Effect of low dose FSH administration on ovarian activity during non-breeding season in the camels

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Abstract

Twelve single-humped female camels were injected with a single dose of 1000 IU of folligon (FSH predominant gonadotrophin) intra-muscularly during non-breeding season and mated on third day post- treatment. Eight animals serving as control were sham-treated with saline and were also mated. Blood samples from all these animals were collected on day prior to treatment, on day of treatment, on day of mating followed by 5 or 6 samples with a gap of 1-2 days till day 21 post-treatment. Sera were analysed for progesterone using RIA technique. The progesterone profiles exhibited 3 patterns suggestive of fertile, ovulatory and anovulatory cycles. In the treated group, the ovaries were activated in 5 out of 12 animals (40%) as against 2 in 8 (25%) in the control group.



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A case of heat stroke in an adult camel

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Abstract

The present report describes a clinical case of heat stroke in an adult camel. The affected camel responded to spraying of cold water, antipyretic and dexamethasone treatment.



Traditional camel production in the Indian desert ecosystem and its perception in changing socio-economic scenario

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Abstract

Camel can play extremely important role in augmenting (economically) sustainable livestock production system in the Indian arid zones. The untapped potentials of camel are, however, required to be explored optimally, particularly the use of camel milk, hair, hides, and meat. Camel power is generally under utilized in-India. Apart from traction and ploughing, it should also be utilized for other diversified works so that camel rearing becomes more economical. It is emphasized that the camel development activities should be strictly need based and should not impose superfluity risk on the current camel management system. The best prospect for success of any package of practices for improvement of production health and economic, viability of the camel rearing seems to rest upon technologies on improvement of the traditional know-how. Most probably, this view does not underestimate deep desire of Indian camel herdsman for improvement of traditional management through incorporation of modern technological advances in livestock management which are essential for augmenting their standard of living.



Camel draught power for rural energy

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Abstract

The camel can play an extremely important role in augmenting economically sustainable livestock production system in the Indian arid zone. The untapped potential of camel is, however, required to be explored optimally particularly, camel milk, hair, hide and meat. The camel power which is underutilized should also be utilized for other diversified utility so that camel rearing becomes more economical. It is emphasized that the camel development activities should be strictly need based and should not impose superfluity risk on the current camel management system.



Nutrient utilization in growing camel calves kept at two watering schedules

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Abstract

The nutrient utilization by the growing male Bikaneri camel calves, aged 1.5 to 2.0 years, were compared at two watering schedules, viz. daily (group 1) and weekly (group 2). The calves were maintained on dry mothchara (*Phaseolus aconitifolius*) and hydroponically grown barley fodder (*Hordeum vulgare*) in 70:30 ratio for 85 days during winter. The digestibility coefficients of feed components in group 1 and 2 were respectively: DM, 83.22 and 84.78; OM, 87.86 and 88.01; CP, 88.22 and 82.86; CF, 72.49 and 78.00; EE, 79.90 and 83.41; and NFE, 90.05 and 91.16. The nitrogen balance was higher in group I (78.32 g) than in group 2 (64.80 g). The nutrient intake/kg $W^{0.75}$ in terms of DM, DCP and TDN in group 1 were 74.17, 7.92 and 63.14, and in group 2 were 77.76, 7.66 and 66.87 respectively. The water intake was higher in group 1 (2.882 l/kg DMI) than in group 2 (0.672 l/kg DMI). The results indicated that although the camel calves could withstand weekly watering schedule in the winter season, it negatively affected growth rate by 23.71%.



Draught performance of Indian camels of Bikaneri breeds

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Abstract

The Bikaneri camels (8-12 years) weighing 646.4 ± 25.5 kg were subjected to payload of 2.8 kg/kg body weight on a 4-wheel cart. The camels covered 25.5 km distance in 4.9 ± 0.08 hr at an average speed of 1.53 ± 0.04 m/sec in a continuous work spell during summer season. The respiratory frequency, pulse rate, skin and rectal temperature increased by 314, 84, 14.8 and 6.8%, respectively, over the initial values. Loss in the body weight due to work stress was 3.6%. With the increase in work stress from initial 5.1 km span to the concluding distance of 25.5 km, the speed, tractive force, work output and power output were reduced by 21.6, 8.8 and 33.8% respectively. The power and work output per kg body weight decreased with the increase in live weight. Associations of draught force with some body measurements were estimated.



Effect of water restriction on nutrient utilization in Indian camels during summer

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Abstract

Six adult male camels of Bikaneri breed aged 5-6 years were maintained on moth chara (*Phaseolus aconitifolius*) and twice weekly watering schedule for 4 months. The camels were divided into 2 groups of 3 each. Group 1 on twice a week watering schedule served as control while the other group was deprived of drinking water for 10 days. The dehydrated camels were offered ad libitum water on 11th day followed by twice weekly watering schedule. The digestibility of all the proximate components showed continuous decline with increasing dehydration period and became negative from 8th day onwards. One of the experimental camels stopped eating from 8th day onwards. The nitrogen- intake and faecal nitrogen excretion (g/d) decreased by 98.9 and 90.2%, respectively, while urinary nitrogen excretion increased by 106.2% on the last day of dehydration resulting in negative nitrogen balance (-32.5 g/d) and nitrogen retention (-2166.7%/d). The weight loss in dehydrated camels was 17.3% and the intake of dry matter, digestible crude protein and metabolisable energy reduced by 98.8, 100.0 and 102.7% respectively on the 10th day. After 96 hours of once water intake on rehydration, the digestibility coefficients of all the components reached almost initial levels.



Recent revelation about ovulation in camel: an updated review

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Abstract

Camel is an induced ovulator and needs mating stimulus for ovulation. Mechanical stimulation of cervix is not effective in causing ovulation. Insemination of seminal plasma can cause ovulation indicating the presence of some ovulation inducing factor in it. The nature of the ovulation inducing factor was found similar to GnRH. The relation of ovulation with reproductive hormones is described. The pre ovulatory peak of LH and the post ovulatory peak of progesterone seem to be the important indicators of ovulation. The information has important bearing on artificial insemination in camel.



Thyroid status of female camels following mating

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Abstract

Adult dromedary female camels (18) were mated with virile studs and blood samples were collected on day of mating (day 0) followed by day 1, 3, 6, 9, 12, 15, 18 and 21 post-mating. The sera samples were analysed for thyroxine (T_4) and triiodothyronine (T_3) using specific RIA kits for each hormone. T_4 values were highest in anovulatory and lowest in ovulatory but unconceived animals. Intermediate levels between these two extremes were observed in camels which conceived to service. Lowest T_3 values were recorded in anovulatory, highest in ovulatory and intermediate in fertile camels. The ratio between T_4 and T_3 was highest for anovulatory, lowest for ovulatory and intermediate for fertile camels.



Effect of watering schedule on intake and digestibility of nutrients in camels

R.C. Jakhmola

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Abstract

In Bikaneri camels effect of different watering schedules on intake and digestibility of nutrients were studied. Camels consumed 12.46 ± 0.58 , 10.29 ± 0.50 and 6.09 ± 0.71 kg water on a daily basis in daily (DW), twice weekly (BW) and once weekly (OW) watering schedule, respectively. The dry-matter intake which was highly related to water intake was 5.93 ± 0.155 , 4.76 ± 0.450 and 3.83 ± 0.413 kg/day in DW, BW and OW respectively. The water intake was closely related to excretion of water in both faeces and urine. The effect on digestibility of nutrients of watering schedule was nonsignificant.



Feeding energy supplements to adult male camels during winter

R. C. Jakhmola and A. K. Roy

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Abstract

Three animals were offered randomly either moth chara (*Phaseolus aconitifolius*) alone (NS) or with 500 g barley (SC) or 150 g oil (SO) for 1 month before switching over to different diet according to 3 x 3 latin-square design. The energy to CP ratio (kcal/g; ME/CP ratio) was 17.74 in NS. It increased to 18.25 and 18.9 in SC and SO respectively. Multiple correlation analysis indicated negative correlation ($R = -0.723$) between glucose and ME/CP ratio. The change in weight (g/100 kg W/day; Delta-W) had high relationship with glucose ($r = -0.816$), alanine transaminase ($r = -0.605$), calcium ($r = 0.599$) and serum protein (-0.497). The ME/CP ratio, dry matter intake and body weight together could explain 86.7% variability in Delta- W. A suitable energy supplement is required during winter.



Trypanosomosis in camel (*Camelus dromedarius*) with particular reference to Indian Sub-Continent: A Review

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Abstract

Trypanosomosis (Surra) caused by *Trypanosoma evansi* is a problem of great economic importance in camels. The disease may be acute, causing early death if untreated or chronic, resulting in severe anaemia, loss of milk and meat, abortion, premature birth or infertility. All camels are susceptible regardless of breed or age. The parasite is widely distributed in the tropical and sub-tropical regions of North-Africa, the middle east, the Indian sub-continent and South America. The paper seeks to review the literature on trypanosomosis in camel with particular reference to the Indian sub-continent emphasizing the gaps in the available information.



Effect of water restriction on nutrient utilization in pack camels under hot humid condition

A. K. Rai, A. K. Nagpal and N.D. Khanna

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Abstract

Adult male camels (6) of Bikaneri breed aged 8-11 years were managed under similar conditions. They were divided into 2 groups of 3 each. They were loaded with 100 kg baggage and made to walk for 2 hr daily. Group 1 on twice weekly watering schedule served as control while group 2 (experimental) was deprived of drinking water for 10 days and offered ad lib. water on eleventh day. The camels lost 21.8% body weight on 10 days dehydration. The DM intake of experimental camels fifth day onwards reduced to negligible quantity. The digestibility of all the proximate components showed continuous decline with increasing dehydration period and became negative from fourth day onward. The faecal and urinary nitrogen excretion (g/day) decreased by 91.6 and 34.7%, respectively, on the last day of dehydration. The nitrogen balance and retention was negative. The digestibility coefficients of all the proximate components after 72 hr of once watering reached almost the initial levels, the daily nitrogen intake and excretion through faeces and urine was 42.6, 34.9 and 217.7%, respectively, of first day value. The improvements in nutrient intake varied from 44 to 55%. The camels regained 48.1 % of the lost weight. The results suggested that the working pack camels on dehydration efficiently maintained normal metabolism up to fourth day and further dehydration depressed DMI and digestibility. Rehydration after 10 days of experimental dehydration improved the metabolic profile but did not attain normalcy even after 72 hr of watering.



Effect of water deprivation on nutrient utilization in Indian camels during winter

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Abstract

Indian camels (6) of Bikaneri breed, aged 4-5 years, were maintained on dry chaffed *Phaseolus aconitifolius* fodder for 2 months during winter. The camels (3) in group 1 on twice-a-week watering schedule served as control. Group 2 camels (3) were deprived of drinking water for 20 days. The digestibility coefficients of dry matter (DM), crude protein (CP) and ether extract (EE) after an initial decline showed an increase during the last phase of dehydration (18-20 days) but the crude fibre declined continuously. There was a continuous decrease in the balance of nitrogen following dehydration. The average body weight (kg), and intakes of DM, DCP and TDN ($\text{g/kg W}^{0.75}$) exhibited significant ($P < 0.01$) decrease between days 18- 20 of dehydration in comparison to initial values. After rehydration, the pre-dehydration status of body weight, nutrient intake and utilization pattern was achieved. The results indicated that camels could tolerate 20 days of water deprivation stress during winter and were capable of regaining their normal nutritional and metabolic pattern on rehydration.



Augmentation of early reproduction through hormonal therapy in camel heifers

S. P. Agarwal, A. K. Rai, S. Vyas and N. D. Khanna

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Abstract

Twelve prepubertal female camels of two to two and a half years of age were divided into three groups. Group I and II were administered 250 mg Duraprogen (A progesterone derivative) intramuscularly for two consecutive days followed by 2000 IU Trophovet (A FSH predominant preparation) on the third day, The animals were periodically examined per rectum and those having mature follicles on their ovaries and expressing sexual interest were mated with a virile stud on two successive days. Following first mating, Group I and II received 3000 IU Chorulon (A HCG preparation) and 30 mcg Receptal (A GnRH analogue), respectively to ensure ovulation, Animals which failed to conceive were again mated and observed for pregnancy. Periodical blood samples were collected and analysed for progesterone concentration by RIA. Animals in Group III were injected with sterile saline solution and served as control. All the animals in treated groups responded to treatment. A total of 10 follicles in Group I and 9 in Group II and 8 corpora utea in each of these groups were detected indicating multiple ovulations but none of the animals conceived in the first service. In the subsequent service, one animal each in groups I and II became pregnant. None of the animals in control group expressed any sexual activity.



Effect of feeding *moth chara* (*Phaseolus aconitifolius*) supplemented with concentrate and stage of pregnancy on certain blood metabolites in camel

R. C. Jakhmola and A. K. Roy

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Abstract

Nine camels at 9 months of pregnancy were divided into 3 groups of 3 animals each. Group 1 (T-1) was given *moth chara* (*Phaseolus aconitifolius*) *ad lib*. Camels of groups 2 (T-2) and 3 (T-3) were offered daily 1 and 2 kg concentrate mixture, respectively, along with *ad lib. moth chara*. Daily feed records and monthly serum analysis reports were maintained. Cholesterol, total protein, albumin and globulins did not differ between treatments. However, urea in serum increased with increasing level of concentrate in diet. A negative correlation between ME/CP ratio and serum urea existed. Serum cholesterol level increased progressively with the advancement of gestation, whereas urea in serum increased significantly after 11 months of pregnancy. Highest values were achieved immediately after parturition. Total protein, albumin and globulin level in blood did not change much during pregnancy.



Concentration of steroid hormones in the poll gland secretion of Indian camel

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Abstract

The poll gland secretion was collected from four breeding camel studs in rut and analysed for testosterone, progesterone and oestradiol 17-B by radioimmunoassay. The mean concentration of testosterone, progesterone and oestradiol 17-B in poll gland secretion was found to be 132.9 ± 12.19 ng/ml, 2.67 ± 0.39 ng/ml and 247.0 ± 47.4 pg/ml, respectively. The concentration varied widely between samples from the same stud as well between studs.



Occurrence of pox infections in camels

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Abstract

Occurrence of camel pox and contagious ecthyma infections in a camel herd at Bikaner has been recorded from 1986 to 1992 on the basis of clinicopathological and pathogenicity studies/observations alongwith the management of the outbreaks. The data provided indicated strong evidence of seasonal occurrence of both the infections i.e. camel pox occurring in winter (January-February) and contagious ecthyma during autumn after the rains (September-October). Both the infections were mild in nature and mainly affected young stock up to 3 years of age.



Nutrient utilization and serum electrolytes in pack safari camels

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Abstract

Metabolism trial was conducted on 3 adult male Bikaneri camels which had covered approximately 950 km distance in 28 days in camel safari during December 93 - January 94. During the trial period these camels carried 100 kg pack load and covered 40 km distance daily in 6 hr with 2 hr rest in-between. The nutrient utilization, serum electrolytes (Na, K, Ca and P) and cardinal responses were studied. The average daily nutrient intake was 73.17 ± 3.87 g DM, 3.41 ± 0.26 g DCP and 0.59 ± 0.04 MJ ME/kg $w^{0.75}$. The camels maintained their body weight and positive balance of nitrogen, Na, K, Ca, P and Mg during the metabolism trial. The serum Na and Ca decreased significantly whereas, K increased after work stress. No change in serum P was observed. Respiratory frequency (118.6%), pulse rate (45.2%) and rectal temperature (4.6%) increased. The results indicated that the camels could tolerate the work stress without any apparent ill effect on health.



Sexual behaviour of camels and poll gland secretion during breeding and non-breeding season

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Abstract

Sexual behaviour of adult camels of both the sexes during breeding and non-breeding seasons was reported by observing (i) male and female in isolation, (ii) male in close proximity with she camels, (iii) male introduced in coral of she camels, and (iv) during mating. Rutting in male was exhibited by restlessness, loss of appetite, grinding of teeth, blowing soft palate, gurgling sound and copious secretion of poll gland during breeding season. She camels also exhibited restlessness, interest in male camels and willingness for mating. During non-breeding season sexual behaviour was subdued or undistinctive in several cases. Rate of poll gland secretion was 0.14 ml/min with pH ranging from 8.5-9.0. Secretion contained glucose 9.46 mg/dl, total protein 1.77 g/dl, albumin 0.13 g/dl, urea 14.36 mg/dl and calcium 4.15 mg/dl. Results were discussed in the light of seasonal reproductive behaviour.



Hair Production in Indian camels (*Camelus dromedarius*) managed under farm conditions

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Abstract

Breed and agewise annual hair production in three breeds of camels are reported. The breedwise average hair production upto 1 yr, 2-3 yr, 4-6 yr and above 8 yr was 0.847 ± 0.355 , 0.939 ± 0.05 , 1.125 ± 0.182 and 1.035 ± 0.07 kg in Bikaneri, 0.542 ± 0.068 , 0.600 ± 0.04 , 0.637 ± 0.034 and 0.891 ± 0.498 kg in Jaisalmeri and 0.545 ± 0.046 , 0.564 ± 0.048 , 0.717 ± 0.051 and 0.896 ± 0.044 kg in Kachchhi breeds respectively. Significant effect of age and breed were observed, while effect of sex and interaction was non-significant. Annual hair yield was higher in the Bikaneri breed as compared to Jaisalmeri and Kachchhi.



Comparative study on blood serum enzymes in Indian Camel

R. Singh, G. Raisinghani, M. Kasturi, S. N. Tandon and N. D. Khanna

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Abstract

The activity of acid phosphatase (AP), alkaline phosphatase (ALP), amylase, lactate dehydrogenase (LDH) and total protein was determined in blood serum of three Indian camel breeds viz., Bikaneri, Jaisalmeri and Kachchhi. Significant age effect was observed for alkaline phosphatase, amylase and lactate dehydrogenase, while no breed differences were observed.



Preovulatory LH surge in female camels (*Camelus dromedarius*) and its association with subsequent ovarian events

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Abstract

Five adult female camels in estrus were given natural service by virile studs and blood samples were drawn immediately after mating and subsequently at two hourly intervals upto ten hours and then one sample each on day 7 and 20 post mating. Sera samples collected on the day of mating were analysed for LH and others for progesterone by RIA. An LH peak was detected in four of the five camels within a range of 3.0 to 7.5 WHO 2nd IRP- HMG ml. The peak appeared between 2 and 8 hours after mating. Females exhibiting LH surge ovulated and developed an active corpus luteum as revealed by higher progesterone concentration (more than 1 ng/ml) on day 7 post mating.



Ovario-pituitary response to exogenous hormones in the postpartum female camels (*Camelus dromedarius*)

S.P. Agarwal and N.D. Khanna

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Abstract

Dromedary female camels (6) which had just completed involution of uterus were injected with 250 mg hydroxyprogesterone caproate i.m. followed by 1000 IU eCG on 2 consecutive days. Mating was allowed between days 4 and 6 post-eCG treatment. The mated camels were injected with 3000 IU hCG or 40 mcg GnRH intravenously. The response was evaluated through transrectal examination of ovaries and estimation of blood progesterone through various stages of the follicular cycle. Only 2 camels receiving eCG and hCG ovulated. None of the other camels ovulated or conceived. Ovaries responded to hCG by effecting ovulation but the pituitary was refractory to exogenous stimuli of mating and GnRH even after involution of the uterus.

Keywords: Camel, dromedary, hormones, postpartum.



History of camel in Indian Context

N.D. Khanna

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Abstract

Most of the camels in India have one hump. It is now widely accepted that in the Pleistocene period, the genus *Camelus* existed in North America and the contemporary Indian camel was derived from this source. It is also believed that the early *Camelinae* had migrated into Asia across Bering Straits during late Pliocene or early Glaciation times. The earliest fossils dated from lower Pliocene were found in Siwalik Hills of northern India and were related to *C. sivalensis* and *C. antiquus*.

Ancient literature from India contains many references to camel. In the Vedic literature such as Ramayana and Mahabharata, camel is referred at several places under different contexts. Panini (circa 500BC) had mentioned camels and camel products. Similarly, several references are available from Mauryan age (circa 322-332 BC) through Mughal period (1200-700AD) and to the present period about use of camels for trade and transport. Detailed information on camels in the context of religion, art and coinage have been provided. The British established a camel-breeding farm at Hisar in 1809 for supplying camels to the army. Distribution of *C. dromedarius* (one- humped camel) in India is presently confined to the drylands located in parts of Rajasthan, Gujarat, Punjab, Haryana, Uttar Pradesh and Madhya Pradesh. Around 55-60 two humped camels (*C. bactrianus*) are available in Leh district of Ladakh. These animals are believed to be from the original stock of Yarkhandi camels which operated on the silk route. The role of camel in providing bioenergy for transport and agricultural operations is discussed.



Camel semen during breeding and non-breeding seasons

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Abstract

Camel semen production, evaluation and seminal characteristics during breeding and non-breeding seasons (hot humid and hot dry) have been reported. The colour, consistency, pH, sperm concentration, percent live sperm and motility did not show much variation during different seasons. Sperm abnormalities increased during non-breeding season and the most predominant abnormalities were found in the mid-piece. Gel formation occurred immediately after ejaculation which liquified within 2 hr when kept at 37⁰C. The results are discussed in relation to sexual behaviour and hormonal levels in the serum of the camel.

Keywords: Camel, breeding season, non-breeding season, semen



The nyctohemeral rhythm of melatonin secretion in camel (*Camelus dromedarius*)

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Abstract

The melatonin, a hormone secreted by the pineal gland, was assayed in three she-camels located in the South of France. It was revealed that, like in other farm animals, there is a nyctohemeral rhythm of melatonin secretion in camel (*Camelus dromedarius*).

Keywords: Dromedary, melatonin, reproduction, France



Off season breeding in camel by photoperiodic control

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Abstract

Six adult sexually inactive female camels were divided into treated and control groups. The camels in treatment group were applied with a specially designed face mask for six hours (9.30 am to 3.30 pm) to prevent solar light on the eyes. The paradigm was maintained for about a month. The animals were periodically checked for their sexual response. Camels exhibiting interest in the stud were mated. Blood samples collected on the day of mating, 8-10 days and 25 days post mating were analyzed for progesterone concentration by RIA. All the four animals in treatment group exhibited sexual interest after about 25 days of Photo periodic control. The ovaries exhibited folliculogenesis and production of mature follicles. All four camels allowed mating of which three ovulated and two conceived. However, one of the conceived animals suffered from early embryonic mortality. The control animals did not express any sexual interest and their ovaries remained inactive. The results indicated that the photoperiodism plays an important role in the seasonal breeding behavior of the camel.



Early pregnancy diagnosis through serum progesterone estimation in camels (*Camelus dromedarius*)

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Abstract

Blood samples from 12 female camels were collected from jugular vein on the day of mating and then on day 7 and 20 postmating. In seven animals, higher progesterone level was maintained upto day 20 post mating indicating successful conception. The pregnancy could correctly be diagnosed in 86% of the animals as one animal suffered from early embryonic mortality. It was also observed that out of 12 camels, one (8.33%) did not ovulate, four (33.33%) failed to conceive and one (8.33%) suffered from early embryonic mortality.



Seroconversion and duration of immunity in camels vaccinated with tissue culture inactivated rabies vaccine

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Abstract

A study was conducted in camels (*Camelus dromedarius*) vaccinated with a single dose, or two doses, of inactivated tissue culture rabies vaccine. The seroconversion pattern and duration of immunity were then monitored for 48 months. The study indicated a good serological response when measured in terms of the Rapid Fluorescent Focus Inhibition Test (RFFIT). Titres ranging from 2.13 ± 1.2 IU to 6.07 ± 2.03 IU at one month post vaccination period, and serum antibody levels above 0.5 IU were maintained for 48 months post-vaccination period in both groups of animals. This study indicated that inactivated tissue culture rabies vaccine induced a satisfactory immune response in camels when tested for a period of 48 months.

Keywords: Camel, *Camelus dromedarius*, seroconversion, prophylaxis, Raksharab, India



A typology of camel farming systems in Bikaner and Jaisalmer districts of Rajasthan, India

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Abstract

One hundred ninety-six camel owners of Bikaner and Jaisalmer districts in Rajasthan were investigated in 23 villages connected by metalled roads from July to September 1997. Questions about camel management and utilization were asked. Discriminatory parameters and methods were identified while running multivariate analysis with SPAD 3® software. They were assigned to defined classes to carry out a typology of camel farming systems. Five classes related to camel owners' activities and revenues were identified: 1) wealthy farmers (47%); 2) modest farmers (25%); 3) rearing activities predominating (19%); 4) very large families (6%); 5) poor landless breeders (3%). Four classes related to herd structure were defined: 1) medium-size camel herds (40%); 2) large herds of various species (28%); 3) single male camel herds (27%); 4) she-camel herds (5%). Six classes related to camel rearing objectives were revealed: 1) cart used for both business and farm (32%); 2) cart used for farm only (19%); 3) camel trade (19%); 4) ploughing and/or under-used camels (13%); 5) multipurpose camels (11 %); 6) income from trade first and cart second (6%). Four classes related to nutritional management and health status were identified: 1) grazing around a village associated to stall feeding (39%); 2) stall feeding only (38%); 3) poor animal health status associated to migration (15%); 4) good health status associated to migration (8%). An overall typology was then defined from the previous four typologies. Nine classes were depicted, four of which represented 75% of camel owners and six were related to specific districts and/or areas.

Keywords: Camel, dromedary, animal husbandry method, classification, Rajasthan, India



Comparative studies on stall-feeding and continuous pasture grazing systems on camel production

A. K. Nagpal, B. D. Kiradoo, R. Purohit, G. Mal and R. Kumar

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Abstract

Stall feeding on *ad lib.* ration of dry moth chara (*Phaseolus aconitifolius*) was compared with grazing on sewan (*Lasiurus sindicus*) pasture for all the 24 h using 7 and 21 camel calves (1.5 to 3.0 yrs) respectively in each group. Growth of calves kept at stall was non-significantly higher (354 g/d) than those kept on sewan pasture (310 g/d) over 98 d. The blood picture did not vary between the groups for hemoglobin, glucose and cholesterol, however, serum total protein, albumin, urea, blood urea nitrogen levels were lower ($P<0.05$) in stall fed calves than those on grazing. The serum enzyme activities of alanine transferase and creatine kinase were higher ($P<0.01$) and alkaline phosphatase activity was lower ($P<0.01$) on grazing. Stall fed camel calves spent 29.80 % of their feeding time and 22.62% for rumination as against 65.62% feeding time and 11.70% rumination time on grazing. The nutrient intake of DM, DCP, ME/kg $W^{0.75}$ and water intake/kg $W^{0.82}$ of stall-fed group was 79.04 ± 1.51 g, 4.44 ± 0.19 g, 0.678 ± 0.03 MJ and 12.91 ± 2.78 ml, respectively. Grazing by camel calves enhanced ($P<0.05$) the soil carbon from 0.07 to 0.23%, available potash from 245.0 to 532.50 kg/ha without affecting available phosphate. Camel calves performed better in stall feeding system because of better plane of nutrition and there is still enough scope of camel improvement on sewan pasture through adding leguminous varieties, fertiliser application and supplementation.

Keywords: Stall feeding, grazing, blood analysis, grazing behavior, camel.



Utilization of Bui (*Aerva tomentosa*) leaves in the ration of camel

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Abstract

Four camel calves (2 yrs; 291.50±14.60kg) were fed on control ration of dry moth chara (*Phaseolus aconitifolius*) for one month, thereafter switched over to experimental ration consisting dry moth chara and dry bui (*A. tomentosa*) leaves in the ratio of 80:20 for another one month. Difference between the diets (or nutrient intake and digestibility of nutrients) was not significant. The apparent absorption of macro-elements such as Na, K, Ca, P and S did not differ significantly except that of Mg ($P<0.05$) on experimental diet. Serum glucose also reduced significantly ($P<0.05$) on experimental diet. These results indicated the need to inactivate the incriminating factor of bui leaves for better utilization as camel feed.

Keywords: Bui leaves, nutrient digestibility, mineral absorption, camel



Growth, feed utilization efficiency and nutrient utilization in growing camel calves

A. K. Nagpal, M. S. Sahani and A. K. Roy

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Abstract

Five Bikaneri camel calves (average age 19 days, b.wt. 49.8 kg) were maintained on suckling for 11 months and dry moth chare (*Phaseolus aconitifolius*) was offered *ad. lib.* from 4th month onwards. Feed efficiency (DMI kg /kg ADG) of calves on milk decreased initially upto third month (0.62+0.07) followed by continuous increase upto 9th month. (8.19+2.98) and declined slightly in 11th month (7.48+2.82). The digestibility of CF was found to be low (40.06%) in 10th month and the nutrient requirements of 185.5kg calves were met through an intake of 57.69 g DM, 4.87 g DCP and 0.571 MJ ME/Kg W^{0.75}. The apparent absorption (from digestive tract taking into consideration faecal excretion) of Na, K, Ca, P, Mg, Fe, Zn, Mn, and Cu from milk, moth chara and drinking water were 21.27, 73.93, 31.17, 44.78, 28.04, 28.82, -20.45, 1.20 and 34.65% respectively indicated the need of zinc supplementation in the diet of camel calves and for higher growth, concentrate feeding may also be remixed.



Voluntary feed intake, digestibility and utilization of macro and micro-elements in dry and pregnant camels

A. K. Nagpal, M. S. Sahani and A. K. Roy

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Abstract

Nine adult Bikaneri female camels maintained on dry moth chara (*Phaseolus aconitifolius*) were equally divided into 3 groups of 3 each viz., dry camels (I), in first pregnancy (II) and in fourth pregnancy (III). All the pregnant camels were given 2 kg concentrate mixture in addition to *ad libitum* moth chara for a period of 130 d. The average daily gain (ADG) of 276.93±16.31, 631.73±19.49 and 967.30±14.85 g was recorded ($P<0.01$) in groups I, II and III, respectively. The digestibility coefficients of proximate components except CP and EE did not differ significantly. Higher ($P<0.01$) DCP intake ($\text{g/kgW}^{0.75}$) was observed in groups II (6.30) and III (5.47) as compared to group I (3.27). The apparent absorption of Na, K, Ca, Fe, Zn and Mn did not differ among the groups. Phosphorus absorption (%) was significantly ($P<0.05$) higher in groups II (37.34) and III (42.20) as compared to group I (17.35). Mg absorption tended to decrease from group I to II and became negative in group III. Serum levels of Ca and P were significantly ($P<0.01$) lower in group III than in other groups. The results indicated that pregnant camels required 134-137% higher DCP, 66-72% higher ME compared to dry camels.

Keywords: Feed intake, nutrient digestibility, minerals, camel



Voluntary feed intake and utilization of macro and micro nutrients in dry and lactating Bikaneri camels

A. K. Nagpal, M. S. Sahani, A. K. Roy and G. Mal

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Abstract

During the course of 10 months study, 3 dry (B.Wt.457.33±30.38 kg) and six lactating camels, two in 1st and four in 4th lactation (B. Wt. 572.28±21.97 kg) were maintained on sole diet of dry moth chara (*Phaseolus aconitifolius*). The dry camels maintained their body weights whereas the lactating camels lost 13.78 % live weight during the lactation period. The average milk yield litre/kg DMI increased from 0.57 litre in the first month to 0.80 litre in 6th month and declined to 0.47 litre in the 10th month. During 5th month the nutrient intakes of lactating camels were 83.33 g DM, 4.22 g DCP and 0.723 MJ ME/kg W^{0.75} respectively and were higher than the dry camels by 36.32, 45.02 and 41.18 %, respectively. The apparent absorption of Na from the digestive tract in dry and lactating camels was -8.30 and -50.5 %, respectively, where as it was positive for K, Ca, P, Mg, Fe, Zn and Mn. The efficiency of utilization of digestible DM and CP for milk was 10.72 and 29.40 % respectively and that of absorbed minerals viz. K, P, Mg, Fe, Zn and Mn was 14.74, 52.05, 3.79, 0.20, 4.55 and 0.58 % respectively. The lactating camels were secreting 7.03 g Na, 4.39 g Ca and 190.27 g fat daily in 5.10 litre milk which was more than the apparent absorption. The results indicated that the lactating camels consumed higher DM (37-46 %), DCP (45-59 %), ME (37-56 %) and also macro- and micro-elements than other dry camels. The milch camels required higher nutrients during 4th lactation in comparison to 1st lactation. The lactating camels should be supplemented with energy, protein as well as minerals according to the milk production and for body weight maintenance.



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The fast dwindling species of Ladakh brief note

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Abstract

The double- humped Bactrian camel is not only a unique and beautiful animal but also an economically viable one, adapted under dry cold condition of Ladakh, since the time these were introduced by the traders of Yarkand in the nineteenth century, through the silk route. The Bactrian camel derives its name from an empire of 900 BC between the Margos in the south-west, the Hindukush mountains in the south, and the Hisar range in the north-east, at that time the capital of Bactria was Bactra, the present day Balkh in Afghanistan.

There is an urgent need to conserve the fast dwindling species of Ladakh as the animal can be utilized profitably for production of superior quality hair and preparation of hair products for draught, agriculture purpose and for milk and meat etc.



Milking technique and other factors affecting milk production potential in different breeds of camels under farm conditions

M.S. Sahani, M. Rathinasabpathy, G. Mal and N. D. Khanna

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Abstract

Daily milk production in 4 lactating camels each of Bikaneri and Kachchhi breed belonging to second and third parities and 3 lactating camels of Jaisalmeri breed from third parity was studied. The daily milk production was recorded twice a day at 12-hr interval by 3 different milking techniques, viz. 2-teat stripping and allowing calf to suckle simultaneously, 4-teat stripping, and machine milking. The average daily productions by 2-teat and 4-teat stripping, and machine milking in Bikaneri camels were 4.19 ± 0.11 , 3.2 ± 0.15 and 2.66 ± 0.16 kg/day respectively. The corresponding figures in Jaisalmeri were 3.72 ± 0.17 , 2.17 ± 0.16 and 2.02 ± 0.19 kg/day, respectively. The average daily productions in Kachchhi camels with 4 teat stripping and machine milking was 3.94 ± 0.13 and 3.42 ± 0.14 kg respectively. The morning evening and total daily production per day were higher under 2-teat stripping followed by 4-teat stripping and machine milking. The contribution of breed and parity was significant ($P < 0.01$) under all the 3 milking techniques. The daily milk production with 2-teat stripping varied from 2.37 ± 0.27 to 6.73 ± 0.27 kg/day, with 4-teat from 0.66 ± 0.26 to 5.15 ± 0.25 kg/day and with machine 1.45 ± 0.23 to 5.22 ± 0.04 kg/day. The daily milk production was highest during month 6 of lactation and then it started declining. The month-wise daily average of second parity females varied from 1.61 ± 0.31 to 4.64 ± 0.31 kg/day and for third parity from 2.13 ± 0.25 to 5.86 ± 0.25 kg respectively. The contribution of parity on month of lactation was significant ($P < 0.01$). As compared to evening, the morning milk yield was about 10.0 to 27.0% higher during different months of lactation. The chemical composition of milk during early and late phases of lactation indicated that pH, fat %, SNF and total solids were significantly higher during late phase of lactation. However, the proteins were also higher but not at significance level. Vitamin C was higher at early phase of lactation.

Keywords: Camels, milk production potential



Indian Veterinary Journal 75: 827, September 1998

Treatment of cystic ovarian degeneration in Indian camel (*Camelus dromedarius*)

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Abstract

Successful treatment of two cases of Cystic ovarian degeneration in camels is reported.



Monitoring ovulation and conception employing blood progesterone estimation in female *Camelus dromedarius*

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Abstract

Seventeen adult pleuriparous camel belonging to National Research Centre on Camel, Bikaner, India were examined for presence of follicle (>10 mm diameter) with the help of ultrasound scanner. They were mated with a virile stud and blood samples were collected immediately after mating (day 0) followed by day 7, 14, 21, 30 and 45 post mating. Sera were analysed for progesterone concentration to determine status of pregnancy. Failure of fertilization and/or nidation (66.7%) and inovulation (33.3%) were observed to be the main causes of pregnancy failures. No case of early embryonic mortality (between day 21 and 45) was observed in this study.

Keywords: progesterone, blood, conception, female, *Camelus dromedarius*



Use of Tris and lactose extenders in preservation of camel semen at refrigerated temperature

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Abstract

Tris and lactose extenders were used to extend the camel semen for preservation at refrigerated temperature. A total of 48 split semen samples of 24 ejaculates from 3 adult male camels were examined. The preserved semen samples were evaluated for motility and live sperm at 0, 24, 48, and 72 hrs of preservation. Tris extender was observed to be superior to lactose extender.



Superovulation and non-surgical embryo flushing in Indian camel (*Camelus dromedarius*)

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Abstract

The embryo transfer technology which offers rapid exploitation of genetic potential of superior female has not been standardized in the Indian dromedary. Preliminary trials were conducted for developing embryo transfer technology in Indian camels. The donor she camels were examined by ultrasound for the presence of dominant follicle in ovaries. Various protocols were attempted for superovulation. The two-way long Foley's catheter (26", 18 Fr, 30 c.c.) was used for embryo flushing. The air bulb of catheter was fixed just inside the uterine body to flush both horns simultaneously. DPBS (1.5-2 litres) was used for flushing in about 12 to 14 releases. The media recovered was filtered through Em Con filter and filtrate was searched under stereozoom microscope for embryos. A total of seven embryos were collected out of eight superovulatory treatments. One good quality morula was transferred in recipient.



Camel production system under 3 tier silvi-pasture in arid ecosystem

A. K. Nagpal, B. D. Kiradoo, R. Purohit, A. K. Ray and M. S. Sahani

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Abstract

Eight non-pregnant and 6 pregnant camels were provided 7 hr grazing in 3-tier silvi-pasture (54.7 ha) from July to December, 97 with carrying capacity of 3.9 ha/camel. Both the groups were supplemented with 6.0 kg/d dry moth chara (*Phaseolus aconitifolius*) for the first 77 days and no supplementation thereafter. During supplementation period both groups of camels gained liveweights and lost body weights thereafter. The average daily loss was 83.87 ± 37.36 and 166.13 ± 26.91 g/d in pregnant and non-pregnant camels respectively over 155 days. Blood profile revealed significant ($P < 0.05$) higher blood urea and lower glucose in pregnant camels than in dry camels. The silvi-pasture area was dominated by *Zizyphus nummularia* (27.2%) followed by *Crotalaria burhia* Hamlit (21.8%), *Aerva tomentosa* (16.7%), *Acacia tortilis* (11.5%), *Lycium barbarum* Linn, (10.1%) and rest of the plant species contributing less than 10% each. Availability of fresh fodder was 5.4 q/ha In July, 97 and it declined to 4.7 q/ha in Nov., 97. Forage preference and biting behaviour study showed that camels preferred *Dactyloctenium aegyptium* Linn, Grass ($54.2 \pm 3.6\%$) and *Zizyphus nummularia* shrubs ($20.8 \pm 2.6\%$) over other plant species. Camel grazing caused soil nutrient loss in percent carbon (0.02), available potash (43.5 kg/ha) and available phosphate (7.3 kg/ha).



Studies on stall-feeding of groundnut fodder vis-à-vis 3-tier silvi-pasture grazing in arid ecosystem

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Abstract

Twenty three camel calves (1.5-3.0 years) were divided into 2 groups. Group I of 6 camel calves (3 males, 3 females) was stall-fed on ad libitum ration of dry groundnut (*Arachis hypogea*) guna/chara while group II of 17 camel calves (10 males and 7 females) sent for grazing in 3-tier silvi-pasture for 7 hours a day. The average daily gain (g/ d) was significantly ($P<0.01$) higher in group I (0.427 ± 0.03) than in group II (0.237 ± 0.03). The nutritive value of groundnut guna was 2.89% DCP and 8.72 MJME/kg DM and that of groundnut chara was 3.78% DCP and 8.60 MJME/kg DM in stall-fed group. Both Groundnut guna and chara had low Ca contents and thus its GIT absorption was less (-27.74 and -0.97%). Plant vigour and chemical composition of groundnut crop at different growth stages revealed continuous increase in per cent units of DM (11.67). CF (4.00) and NFE (4.39) with concomitant decrease in per cent units of CP (6.36), EE (1.88) and P (0.17). The annual sustainability of groundnut crop from 11.25 hectares was worked out to be 0.35 ACU (adult camel unit of 500 kg body weight). Cultivation of groundnut crop resulted in depletion of soil nutrients of available phosphate (29.69%) and potash (20.75%) but increase in per cent carbon (+454.90%). Plant biodiversity of 3-tier system consisted of 51.4% edible and 48.6% non-edible species besides ground cover of various grass species. The results indicated that although growth was higher in stall feeding system, better camel growth can be achieved from 3-tier system by way of plant biomass enrichment through introduction of better bushes/shrubs, trees, grasses and supplementation.

Keywords: Camel calves, carrying capacity, groundnut chara/guna, soil fertility, stall feeding, 3-tier silvi-pasture



ECT of dietary phosphorus supplementation on growth and nutrient utilization in camel calves

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Abstract

Nine Bikaneri male camel calves (1.5 years), randomly divided into 3 equal groups, were individually offered Guar phalgati (*Cyamopsis tetragonoloba*) ad lib. and 0.5 kg guar seed meal. Sodium dihydrogen phosphate (Glaxo) was supplemented to the guar seed meal in groups II and III. The Ca:P ratio in group I, II and III was 5.06:1; 2.22:1 and 1.28:1, respectively. There were no significant differences among groups in respects of feed efficiency, growth, nutrient digestibility except EE and nutrient intake. The dietary Ca: P ratio did not alter the absorption of Na, Ca, Mg, Cu and Zn. However, potassium absorption increased ($P < 0.05$) from 90.7% in group I to 96.0% in group III. The absorption of phosphorus increased ($P < 0.01$) from 29.1 % in group I to 74.4% in group II and then decreased to 57.5% in group III. Phosphorus supplementation increased blood hemoglobin from 10.3% in group I to 14.0% in group III, decreased serum Na and alkaline phosphatase (ALP) levels ($P < 0.05$) however, WBC increased ($P < 0.01$) in group III. The results indicated that the Ca:P ratio of 2.22:1 promoted EE digestibility, P absorption besides raising WBC and was optimum for the nutrient utilization and growth of young camel calves.

Keywords: Phosphorus, digestibility, macro- & microelements, camel calves.



Indian Veterinary Journal 76:998-1000, November 1999

Clinico-haematological and therapeutic studies on mange in camels

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Abstract

Comparative clinico-therapeutic efficacy of Himax lotion along with teeburb, Himax ointment along with teeburb, Amitraz (12.5%) were evaluated. Three applications of Himax ointment along with teeburb @ 4 caps BID for 15 days daily orally and two sprayings of Amitraz 12.5% solution at weekly intervals revealed higher efficacy than single application of Himax lotion and teeburb capsules. Among the haematological parameters reduction in Hb content, neutrophils, and an increase in TLC, eosinophils and monocytes were seen in mange affected camels.



Camel carting a subsidiary source of income of camel keepers in the hot arid Bikaner district of Rajasthan

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Abstract

Camel power for farming use is more economical than a pair of bullocks and in the sandy terrain the camel energy is not only cost effective but also profitable. A pilot survey was conducted in the Bikaner city and In the nearby village Gadwala (an adapted village under TOT by NRCC) A total of 69 Farmers from Bikaner and 45 farmers from Gadwala were interviewed for various aspects of carting and it's economics. The study revealed the salient characteristic features of camel used under carting and also focused on the differences of camel carting between city and village and socio economic status of camel farmers in the hot arid region. This study identified three major constraints of camel keepers.



Body weight and dimensions at birth in three breeds of Indian camel

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Abstract

Investigations on 11 Bikaneri, seven Jaisalmeri and 11 Kachchhi camel calves born from December, 1990 to April, 1991 at National Research Centre on Camel, Bikaner revealed no significant differences across breeds for birth weight and body dimensions. The averages for body weight, neck length, heart girth, body length, body height, and length of fore and hind limbs were estimated as 39.10 ± 0.369 kg, 47.46 ± 0.235 , 82.57 ± 0.944 , 61.85 ± 0.366 , 110.32 ± 0.916 , 89.85 ± 0.508 and 96.39 ± 0.646 cm, respectively. The variability was maximum in heart girth (CV=6.16%) and minimum for neck length (CV=2.67%). Sex effect was evident on birth weight. On an average, males were 2.73 kg heavier than females. Such differences were not noticeable in body dimensions. Parity effect was also non-significant on body weight and dimensions except that the neck length of calves born at first parity was 2 to 3 cm longer than those born at second or third parity. Among two factor interactions, breed x sex and sex x parity interactions affected neck length and body length significantly. Increase in parity order from first to third marginally favoured the male foetus in comparison female foetus. Higher dam's weight at calving resulted in birth of heavier and larger calves.



Preliminary attempts to collect and cryopreserve camel semen

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Abstract

The study was conducted with a view to evaluate semen production potential of dromedary camel and its deep freeze preservation. Refusal to serve or ejaculate in artificial vagina (A.V.), aspermic bulbo-urethral secretions and incomplete ejaculations have been the major problems associated with collection of semen in camel. Typical camel semen is sparkling white, thick and viscous and measures 3-20 ml. Liquefaction may or may not occur and when it occurs it may or may not be complete. There is no mass activity in camel semen. Gelification of semen seems to be associated with formation of a fibrous network. Spermatozoa gets tightly packed in the fibrous network and barely get any space to move till liquefaction. Individual sperm motility develops after liquefaction but under the current practices adopted for handling of semen, a significantly large proportion of semen samples failed to sustain motility. Preliminary attempts to cryopreserve camel semen were made in Tris Citric Acid Fructose Glycerol extender. Of the 26 semen samples subjected to deep freezing, 11 (42.3%) frozen thawed semen samples showed motile spermatozoa in acceptable range. The acrosome integrity results have shown that normal intact spermatozoa have been recovered in ranges of 41.97 to 81.25% which seems to be the satisfactory status for frozen thawed semen. It is concluded that camel semen can be cryopreserved successfully for the development of AI in this species but whole of the techniques need to be refined and species specific dilutor is to be formulated to optimise the results.

Keywords: A.I., camel, cryopreservation, semen



Studies on hemolytic complement activity of camel (*Camelus dromedarius*) through alternate pathway

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Abstract

Seventy- five camels of different age groups were screened for the complement activity through alternate pathway using cattle, buffalo, sheep, goat, rabbit and guinea pig as source of RBCs and veronal buffer saline (VBS), Veronal buffer saline –Ethylene –glycol bis tetra acitic acid (VBS-EGTA) with and without Mg^{2+} as diluents. Cattle buffalo, sheep and goat RBCs did not lyse with camel complement. A highest CH_{50} titre of 1:64 was obtained with rabbit RBCs against unabsorbed camel serum, while the CH_{50} titre was observed only in undiluted serum absorbed with rabbit RBC. Different concentration of Mg^{2+} did not show any change in the CH_{50} titre while pH 7.4 was found optimum to bring the highest CH_{50} titre. Zymosan-A and heat treatment arrested the complement activity.



Thyroid Hormone Profile in dromedary camel in winter and summer during water restriction

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Abstract

Thyroid hormone profile alongwith cholesterol in serum were studied in four adult female dromedary camels during water restriction and rehydration in winter and summer. The control mean values of T₄ and T₃ were higher during winter than summer. As the dehydration advanced the concentrations of T₄ and T₃ decreased gradually in both the seasons, the decrease being more in summer. The mean values of T₄ and T₃ touched the control levels at hour 48 of rehydration. A good correlation existed between thyroid hormones and cholesterol. Dehydration and early rehydration affected the correlation in winter and summer.

Keywords: Camel season, thyroid hormone, water restriction



Effect of water restriction on serum aldosterone and cortisol in dromedary camel during winter and summer

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Abstract

Serum aldosterone and cortisol levels were measured during control, dehydration and rehydration phases in winter and summer in four healthy adult female camels. The mean values of aldosterone and cortisol during control phase were 1.7125 ± 0.082 ng/ml and 7.0 ± 1.08 ng/ml, respectively in winter and 3.25 ± 0.33 ng/ml and 11.0 ± 1.08 ng/ml, respectively in summer. The dehydration increased the aldosterone and cortisol concentrations significantly in both the seasons and the increase was much higher during summer. In both the seasons immediately after rehydration the aldosterone concentrations decreased while cortisol concentrations increased. Aldosterone was found positively correlated with serum sodium concentrations.

Keywords: Aldosterone, camel, cortisol, dehydration, rehydration, summer, winter



Role of camel milk as an adjuvant nutritional supplement in human tuberculosis patients

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Abstract

A preliminary study was carried out in collaboration with the Department of T.B. & Chest diseases (S. P. Medical College, Bikaner) to study the therapeutic efficacy of camel milk on human patients afflicted with tuberculosis (T.B.). The patients were grouped as empyema (G1) and fresh pulmonary T.B. (G 2) having a control group in each. The patients were given standard therapy along with raw milk @ 1 kg/day as supplement. The clinical symptoms, bacteriological, radiological, haematological and biochemical parameters were recorded at monthly intervals. However, the body weight was recorded fortnightly. At the end of the trial, increase in appetite, no pus formation, more radiological improvement in terms of lung expansions was found in patients whose diet was supplemented with camel milk in G1. Haematological parameters show significantly higher haemoglobin content ($P<0.01$) significant reduction ($P<0.05$) in neutrophils in the camel milk supplemented group of empyema T.B. patients. The activity of LDH was significantly lower ($P<0.05$) in patients fed with camel milk in G1, while zinc was significantly higher ($P<0.01$). Increase in body weight was also seen. Increase in appetite, reduction in radiological reflection, significantly higher ($P<0.05$) haemoglobin content, reduction in ESR and TLC ($P<0.05$) was noticed in patients with fresh pulmonary T.B. receiving camel milk (G2). Significantly higher ($P<0.01$) Zinc levels and a significant increase ($P<0.05$) in body weight were found in patients whose diet had been supplemented with camel milk. It follows that camel milk can act as an adjuvant nutritional supplement in T.B. patients.



A study on the clinical, haemato-biochemical and histopathological aspects of mange in camels

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Abstract

An experimental study has been carried out to study the clinical, histopathological and haemato-biochemical changes in camels with sarcoptic mange. Clinical signs observed in mange infested camels were pruritus alopecia, scab formation and cutaneous hypersensitivity with extensive lesions on the ventral surface of the body, facial region and limbs. Histological examination of skin revealed epidermal hyperplasia with perivascular infiltration of eosinophils, lymphocytes and plasma cells. Haematological changes revealed significant decrease ($P \leq 0.01$) in total erythrocyte count, total leucocyte count, haemoglobin, neutrophils and monocytes and an increase in lymphocytes in infested camels. There was a significant ($P \leq 0.01$) increase in triglycerides.

Keywords: Camel, Sarcoptic mange, clinical signs, histopathology, haemato-biochemical parameters.



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Chemical composition and vitamin C content of milk in Indian camels managed under farm conditions

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Abstract

Chemical composition and vit-C content in the milk of camels are reported. Significant effects of phases of lactation were observed in pH, ash, fat, SNF and total solids. vit-C content was found to be higher in the early stage of lactation.



Voluntary feed intake and nutrient utilization of adult female racing camels (*Camelus dromedarius*) during exercise and at rest

A. K. Nagpal, A. K. Roy, B. D. Kiradoo, R. Purohit and M. S. Sahani

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Abstract

Three adult female camels (age 6-8 years and average body weight 476.67 ± 16.83 kg) kept on sole roughage diet of dry moth chara (*Phaseolus aconitifolius*) were initially adapted to exercise regimen of daily 1 km race at a speed of 30 km/h in the morning for 3 months in post monsoon season. Thereafter a 6 days digestibility trial during exercise was conducted. After a resting period of one week another 6 days digestibility trial on the same camels was conducted under stall-feeding conditions. The digestibility coefficients of OM, CP, EE, CF and NFE were observed to be higher in camels during exercise by 14.91, 28.09, 32.87, 14.23 and 11.59 % respectively than at rest. The apparent absorption (%) of macro-minerals viz., Na, K, Ca, P and Mg was observed to increase by 95.26, 9.61, 64.58, 43.82 and 52.06 during exercise than at rest. The serum values of K, P and Mg showed significant ($P < 0.05$) rise during exercise. The results indicated that adult female camels during race exercise consumed 94.62% more DCP and 55.30% more ME than at rest.

Keywords: Blood profile, digestible nutrients, macro-minerals, race camels.



Effect of grazing sewan (*Lasiurus indicus*) pasture on female camels in ecosystem

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Abstract

Pregnant and non-pregnant adult camels were allowed 7 hr grazing in 11 ha of sewan pasture for 155 days. Initially 63 days all the animals were supplemented dried moth chara (*Phaseolus aconitifolius*) @ 5.9 kg/day per head. Average daily gain was 589.29 ± 30.30 g/day and 52.91 ± 119.25 g/day in pregnant and non-pregnant camels, respectively, during supplementation period; and the average daily body weight loss during non-supplementation period was -399.07 ± 21.44 g/day and -297.10 ± 44.08 g/day in pregnant and non-pregnant camels respectively. Blood profile revealed significant ($P < 0.05$) higher levels of total protein, albumin, cholesterol, Ca, Cl and lower levels of glucose and Hb in pregnant camel than that in non-pregnant camels. The erratic pattern of rainfall due to the El-Nino effect resulted in the low average of sewan pasture (3.95 q DM/ha) corresponding to carrying capacity of only 0.11 adult camel unit, major cause for camel production. Camels utilized most of their time in grazing while walking ($68.30 \pm 2.49\%$) and preferred grazing mostly *Lasiurus indicus* grass ($55.91 \pm 2.46\%$) and *Dactyloctenium aegyptium* grass ($32.83 \pm 4.33\%$) over other plant species. Camel grazing caused significant ($P < 0.01$) soil nutrient loss of per cent carbon (0.24), available potash (138.33 kg/ha) and available phosphate (21.67 kg/ha). The results indicated the need of supplementation to grazing animals when pasture growth is poor.

Keywords: Blood picture, grazing behaviour, non-pregnant, pregnant camels, sewan pasture, soil fertility, supplement



Prevalence, haematobiochemical studies and chemotherapy of gastrointestinal nematode infection in camels

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Abstract

Screening of 236 faecal samples from individual camels revealed prevalence of 30.1 per cent and 36.86 per cent of gastrointestinal nematodes during May, 1998 and December, 1998, respectively. The eggs of *Strongyloides* spp., *Nematodirus* spp., *Nematodirella* spp. and *Strongyle* spp. were observed. Significantly higher incidence of infection was recorded in 1-3 years age group of camels. Males showed significantly higher incidence than females. Among breeds, Kachchhi breed revealed higher percentage of infection. The mild, moderate and high level of infection was seen in 56.32, 31.03 and 12.64 per cent camels, respectively. A decrease in the haemoglobin content, lymphocytes, total serum proteins, albumin and albumin /globulin ratio and an increase in the total leucocyte count, neutrophils, eosinophils, monocytes, serum glucose and globulin was observed. Albendazole and ivermectin were 96 per cent effective and fenbendazole was 94 per cent effective in the treatment of gastrointestinal nematode infections in camels.

Keywords: Camels, gastrointestinal nematodes, prevalence, haematobiochemical profile, therapy.



Real-time ultrasonography of ovaries and breeding of the one-humped camel (*Camelus dromedarius*) during the early postpartum period

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Abstract

Ovaries of 17 adult, pleuriparous, and lactating one-humped she-camels (*Camelus dromedarius*) were examined per rectum for uterine involution and for presence of follicles (≥ 1.0 cm diameter) by real-time ultrasonography at the National Research Centre on Camel at Bikaner, India at 30, 45, 60, 75, and 90 days postpartum. Involution was completed from 25 to 30 days postpartum and follicles (≥ 1.0 cm diameter) could be found in only nine camels (52.7%) from 34 to 70 days postpartum. These nine camels were mated with virile studs. Four conceived and were confirmed pregnant at 60 days.

Keywords: Ovary, follicles, postpartum period, camel



Impact of camel production system on the sustainability of marginal farmers in hot arid villages of the Thar desert

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Abstract

A grass root level survey was conducted on various aspects of camelid farming which involved four different zones (north, south, east, west) of Thar desert. The required data were collected in the suitable developed and pre - tested proforma from Raikas of Thar desert. In this region the camel to other herbivore (cattle, buffalo, sheep and goat) ratio was 1:21.36. Among the different camel health disorders, parasitic mange case was highest. It was followed by Trypanosomiasis, general fever, respiratory infection, other problems like digestive disorders, worm etc. The mortality in camel calf (<1 year age) and adult were $33.05 \pm 2.63\%$ and $8.10 \pm 1.070\%$, respectively. The average annual productivity of commonly grown, Thar desert crop were 4.89q/ha for guar (*Cyamopsis tetragonoloba*) and 2.75q/ha for moth (*Phaseolus aconitifolius*). The final returns per unit (Rupee) invested was high in case of guar (Rs. 3.36) as compared to Moth (Rs. 2.29). The average cost of rearing of draft camel was low as compared to cattle and buffalo. The final return per unit (Rupee) invested was high in case of camel (Rs. 1.90) as compared to cattle and buffalo (Rs. 1.82) in Thar desert. It is evident that due to higher production potential, increase market price and economic advantage guar cultivation for camel farmers is more profitable than moth cultivation and camel rearing is also profitable as compared to other livestock rearing in terms of per unit investment.



Effect of certain factors on hair quality attributes in Indian dromedary camel managed in an organized farm

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Abstract

Hair samples (188) collected from 4 important body sites of 47 Indian dromedary camels belonging to 3 age groups (1, 4 and 8 year) and from 3 breeds (Bikaneri, Jaisalmeri and Kachchhi) were analysed for quality attributes of hair. The hair samples taken from shoulder, mid, hump, and neck region of individual camel were compared for staple length, hair diameter and hair types. viz. pure, hetro, hairy and kemp. The data were analysed using mixed mode least square and maximum likely hood programme to study the factors like breed sex, site and age influencing hair quality attributes. The mean staple length varied from 4.65 ± 0.42 cm to 6.68 ± 0.21 cm. The body sites and age significantly ($P < 0.01$) influenced the staple length whereas sex had a nonsignificant effect. The Bikaneri camel showed minimum mean hair diameter followed by Jaisalmeri and Kachchhi breeds. The least square analysis indicated significant ($P < 0.01$) effect of all factors, viz breed, sex, site and age on hair diameter. The pure type had minimum hair diameter followed by hetro hairy and kemp in all 3 breeds, both sex, in all age groups and also in all body sites of camel. The factors like breed and age had significant ($P < 0.01$) effect on all types of hair whereas site significantly ($P < 0.01$) influenced pure, hetro and hairy types. The nonsignificant effect of sex on kernp type was also observed. The mid side of body region indicated maximum percentage of pure hair whereas neck region had maximum kemp hair. The breed and age factor affected significantly ($P < 0.01$) all hair types. The sex had nonsignificant effect on hetro, hairy, kemp but significant effect on pure type. The body site had a significant effect on kemp hair.

Key words: Camel hair, dromedary camel, hair quality attributes



Studies on parturition behaviour and neonatal behaviour of camel in loose housing system

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Abstract

A total of ten parturition cases of camel (Bikaneri breed) were randomly selected for study and were kept under the observation in loose housing system from at least one week before the expected date of calving. The parturient camel 'wants to be alone and separate from the main herd' was very common and prominent sign. Similarly, 'showing two grooves on either side of the root of tail', 'concavity between the site of pin bone, vulva was visible swollen round', repeated lying down - standing up, "superficial mammary vein become tense and tortuous and 'swelling of udder and teat were very common sign which indicated that delivery process was likely to be start very soon. The average time (minute) gap between appearance and expulsion of Allanto chorion bag was 3.50 ± 1.00 . The average time (minute) gap between expulsion of Allanto chorion bag and appearance of foetus was 5.25 ± 1.66 . The 100 % cases showed normal presentation (out stretched foreleg with chin of the calf resting on it). The average time (minute) gap between appearance and expulsion of foetus was 6.23 ± 2.44 (assisted labour case) and 42.50 ± 6.50 (unassisted labour case). The post partum average time (minute) taken for expulsion of placenta was 55.86 ± 10.00 . The average time (minute) taken for the calf to stand on his leg was 56.23 ± 10.44 . After parturition maximum dam adapt their calf very quickly but there were few cases (20%) where dam took more time for this adaptation process. The average time (minute) taken for 1st suckling attempt was 80.26 ± 8.53 where as the time interval for suckling was varied from 1 to 3 times per hour. The average (minute) time taken for excretion of muconium was 32.00 ± 5.64 . But the average time (minute) taken for 1st urination was 61.50 ± 2.11 . In maximum cases (90%) the locomotary movement of newly horn calf was normal within 12 to 24 hr after parturition but some calves (10%) took more time to normalize their locomotary movement.



Applicability of commercial progesterone analysis kits standardized on human serum/plasma for progesterone analysis in camel

A. Deen, G. Mal and M.S. Sahani

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Abstract

Progesterone analysis in camel plasma/serum was conducted using commercial progesterone analysis kits standardized on human serum. The results obtained have been either too low with a particular kit or too high with another kit. Matrix effect of protein salt, phospholipid or other contaminant in camel serum/plasma might be responsible for falsely low or high result obtained in present study.

Keywords: Camel, progesterone



Camel lactoferrin, a transferrin-cum-lactoferrin: crystal structure of camel apolactoferrin at 2.6 Å resolution and structural basis of its dual role

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Abstract

Camel lactoferrin is the first protein from the transferrin superfamily that has been found to display the characteristic functions of iron binding and release of lactoferrin as well as transferrin simultaneously. It was remarkable to observe a wide pH demarcation in the release of iron from two lobes. It loses 50 % iron at pH 6.5 and the remaining 50 % iron is released only at pH values between 4.0 and 2.0. Furthermore, proteolytically generated N and C-lobes of camel lactoferrin showed that the C-lobe lost iron at pH 6.5, while the N-lobe lost it only at pH less than 4.0. In order to establish the structural basis of this striking observation, the purified camel apolactoferrin was crystallized. The crystals belong to monoclinic space group C2 with unit cell dimensions $a=175.8 \text{ \AA}$, $b=80.9 \text{ \AA}$, $c=56.4 \text{ \AA}$, $\beta=92.4^\circ$ and $Z=4$. The structure has been determined by the molecular replacement method and refined to an R-factor of 0.198 (R-free=0.268) using all the data in the resolution range of 20.0-2.6 Å. The overall structure of camel apolactoferrin folds into two lobes which contain four distinct domains. Both lobes adopt open conformations indicating wide distances between the iron binding residues in the native iron-free form of lactoferrin. The dispositions of various residues of the iron binding pocket of the N-lobe of camel apolactoferrin are similar to those of the N-lobe in human apolactoferrin, while the corresponding residues in the C-lobe show a striking similarity with those in the C-lobes of duck and hen apo-ovotransferrins. These observations indicate that the N-lobe of camel apolactoferrin is structurally very similar to the N-lobe of human apolactoferrin and the structure of the C-lobe of camel apolactoferrin matches closely with those of the hen and duck apo-ovotransferrins. These observations suggest that the iron binding and releasing behaviour of the N-lobe of camel lactoferrin is similar to that of the N-lobe of human lactoferrin, whereas that of the C-lobe resembles those of the C-lobes of duck and hen apo-ovotransferrins. Hence, it correlates with the observation of the N-lobe of camel lactoferrin losing iron at a low pH (4.0-2.0) as in other lactoferrins. On the other hand, the C-lobe of camel lactoferrin loses iron at higher pH (7.0-6.0) like transferrins suggesting its functional similarity to that of transferrins. Thus, camel lactoferrin can be termed as half lactoferrin and half transferrin.

Keywords: Camel apolactoferrin, crystal structure, X- ray diffraction, transferrin, lactoferrin



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Haematological and mineral profile of Bactrian and Dromedary camels

G. Mal, D. S. Sena, R. Kumar and M.S. Sahani

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Abstract

Haematological and mineral profile of Bactrian and dromedary camels were studied. Higher levels of Hb along with ESR ($P < 0.01$) were found in Bactrian camels. The levels of Zn, Fe and Cu in Serum were also observed significantly ($P < 0.01$) higher in Bactrian camels.

Keywords: Camels, hematology, minerals, serum



Livestock International 4-8, July 2001

Therapeutic utility of camel milk as nutritional supplement in chronic pulmonary tuberculosis

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Abstract

A preliminary trial was conducted in collaboration with Department of TB and Chest diseases (SF Medical College, Bikaner) to evaluate the therapeutic utility of raw camel milk as a nutritional supplement in chronic pulmonary tuberculosis patients. The patients under treatment group were provided with almost similar therapy and diet along with raw camel milk @ 1 kg/day for a period of 3 months; while the diets of patients of control group were supplemented with dairy milk. Data on clinical symptoms, bacteriological, radiological, haemato-biochemical attributes and body weight were recorded at monthly intervals. At the end of trial, the patients in treatment group showed an increase in the appetite as well as in body weight. Haematological findings revealed significantly ($P<0.01$) higher haemoglobin (Hb), reduction in Erythrocyte Sedimentation Rate (ESR) and Total Leukocyte Count (TLC) among camel milk supplemented patients. The activity of Alkaline Phosphatase (ALP) is significantly higher ($P<0.01$). The Triglycerides (TRG) showed a significant decrease ($p<0.05$), Significant ($P<0.01$) increase in micro-mineral Zinc (Zn) content were found in the patients supplemented with camel milk.



Serum biochemical observations on mange in camels

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Abstract

The quantitative biochemical estimations were done on 16 mange infested camels which were treated with Himax lotion, Himax ointment along with Teeburb capsules and Amitraz solution (12.5%). The biochemical parameters revealed an increase in ALT, AST, Total Proteins, Globulins, Triglycerides and a decrease in Albumins and Cholesterol in mange infested camels. The biochemical values returned to normal levels after therapy. Based on these there is a need to formulate supportive therapy to correct these at the shortest period.



Investigation on nutrient intake and utilization in adult male draft camels in Indian arid ecosystem

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Abstract

Three adult male camels (2 Bikaneri and 1 Kachchhi) with mean body weight of 696.0 ± 41.10 kg and age 7- 11 years kept on dry fodder of (*Phaseolus aconitifolius*) were used in 3x3 switch over design from December, 1995 to May, 1996. One camel at rest served as control (T1), while other 2 camels pulled 2 wheel (T2) and 4 wheel (T3) carts for 6 hrs continuously with a payload of 2.5kg/kg body weight. The daily DM intake was lower in T1 (5.5 kg) due to resting status and rutting effect as compared to T2 (3.43 kg) and T3 (8.30 kg), consequently water intake (1/d) was less in T1 (21.3) than in T2 (30.5) & T3 (34.5). The digestibility coefficients of OM, CP, EE, CF and NFE were also observed to be higher in T2 and T3 groups by 4.4 & 6.7; 2.0 & 4.3; 4.6 & 14.1; 13.6 & 12.8 and 2.4 & 5.0% respectively than T1. Draft camels of T2 and T3 groups had higher per cent nitrogen retention of 41.19 and 28.02 respectively as compared to control T1 group (21.39). Due to higher nutrient demand for work, the DCP and ME Intakes/kgw^{0.75} was higher in T2 by 49.2 & 57.9% and 55.9 & 65.5 % in T3 camels as compared to T1. The overall body loss being 42.67 ± 16.71 kg in 160 days indicating the need of nutrient supplementation to maintain the camel body weights and work output.



Improvement in utilization and growth of Bikaneri camel calves through dietary supplementation of urea molasses mineral block

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Abstract

Changes in nutrient utilization and live weight gain of 3 growing Bikaneri calves (2.5 years, 278.67 ± 6.67 kg) were compared given Guar phalgati (*Cyamopsis tetragonoloba*) *ad. lib.* basal diet (Phase I) and when supplemented with 100 g/d Gaur seed meal plus 100 g/d urea molasses mineral block (Phase II). Appreciable increase in live weight gain (269.0 ± 11.00 g/d) digestibility coefficients of CP (23.00) and EE (11.83) was observed in Phase II. The supplementation also increased the apparent absorption of major elements viz., Na, P and Mg by 24.41, 12.27, and 49.49% respectively. Water intake was also found to be higher in Phase II (23.2 l/d) than in phase I (12.33 l/d). The results indicated that nutrient utilization and growth could be improved through dietary supplementation of urea molasses mineral block.



A preliminary study of prevalence of mastitis in camel

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Abstract

To Study the incidence of mastitis during 1999-2000 a total of 38 lactating camels were analysed in an organised farm. The overall incidence of mastitis was 17.36 percent with only 5.55 percent indicating clinical mastitis. The udders were hot and painful in clinical cases and painful in subclinical ones. Camels above 10 years were most susceptible for mastitis. There was a 21.6 percent decline in the bodyweight of camel calves receiving sub-clinical mastitis milk. The positive samples revealed *Streptococcus agalactiae*, *Staphylococcus aureus*, *Escherichia coli* and their mixed infections.

Keywords: Mastitis, camel, India, incidence.



pH as an indicator for detecting mastitis in camels

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Abstract

Milk sample were screened from farm herd for the detection of sub clinical mastitis infection by using pH, California Mastitis test (CMT) and total leucocyte count (TLC). The result exhibited a positive correlation between pH and CMT, CMT and TLC, pH and TLC. Among these 3 indirect tests pH act as a good indicator for detection of sub-clinical mastitis as it is less time consuming, economical and can be done in the field itself.

Keywords: Camel, mastitis



Milk enzymes in different breeds of Indian camel (*Camelus dromedarius*)

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Abstract

Twenty-seven camel milk samples in late lactation stage of three breeds Bikaneri, Jaisalmeri and Crossbred were collected and processed in cold condition for milk enzymes analysis. The activities of camel skim milk enzymes viz., amylase, alkaline phosphatase (ALP), acid phosphatase (ACP), gama glutamyl transferase (GGT), glutamic oxaloacetate transminase (GOT), glutamic pyruvate transminase (GPT) and lactate dehydrogenase (LDH) were determined. No significant inter-breed differences were observed.



Management Practices for augmenting rut in male *Camelus dromedarius*

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Abstract

Short breeding season is important factor responsible for the low reproductive performance of dromedary camel. In the present experiment effect of twice a day parading of male camels in front of herd of female camel in augmenting the “rut” in male camels. Four adult male camels belonging to herd of National Research Centre on Camel, Bikaner were used for the present experiment during the month of October. At the end of study it was revealed that behaviour signs of “rut” was expressed by all four male camels and the intromission and complete act of copulation could be performed only by two (50%) male camels .

Key words: *Camelus dromedarius*, male, rut



Studies on hair production attribute in Indian dromedary camel managed in an organized farm

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Abstract

In order to obtain optimum profit from camel rearing it is essential to study effective utilization of production of camel hair. Annual hair production of 590 dromedary camels belonging to 3 breeds that belonged to 5 different age groups were studied. The Bikaneri breed of camel produced maximum annual hair yield followed by Jaisalmeri and Kachchhi breed. The male camel produced heavier annual hair yield than female in all breeds. The highest annual hair production was at 3 year age group followed by 2, 4 to 6, 1 year and above 6 year age group.



Camel versus bullock carting and it's economics in the hot arid region of the Thar desert

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Abstract

A survey was conducted on various aspects of camel and bullock carting system which involved four different zones (north, south, east, west) of the Thar Desert. An economic study of both types of carting system was undertaken making use of the linear programming method. The average working life of a camel was higher compared to bullocks used for carting. The average life of an animal –drawn cart was higher (about 22%) than that for bullock carting. The total distance covered per day by a camel cart (21.4 ± 6.55 km) was greater than that of a bullock cart (14.9 ± 5.5 km). The camel carting required a higher investment in terms of interest rate, depreciation rate and expenses towards insurance. The overall total fixed cost was higher in camel carting than in bullock carting. In the case of bullocks total annual expenditure for shoeing came to Rs. 800/- where as it is not required for camels. The total variable cost was higher in bullock carting than in camel carting. The average yearly maintenance cost of an animal was around Rs. 15330/- and Rs. 14965/- for a camel and a bullock, respectively. The total expenditure for both type of carting was almost equal, but total earning and profit from camel carting was higher compared to that in bullock carting. It was evident that due to a shorter pay back period and a higher benefit cost ratio camel carting was more profitable than bullock carting for small and marginal farmers in the hot arid Thar Desert.



A comparative study on camel carting versus bullock carting in hot arid region of Thar desert

C. Bhakat and M. S. Sahani

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Abstract

Agricultural economy of India is also dependent upon livestock as a source of draft and traction power. A meticulous grass root level survey study was conducted on various aspects Camel and bullock carting systems which involved four different Zones (north, south, east, west) of Thar desert. A detail economics of both type of carting systems were analysed by using the linear programming method and considered all possible and feasible linear components - subcomponents to reach a final decision. The average working life period of camel (14.50 ± 0.50 years) is more as compared to bullock (10.00 ± 0.66 years) used under carting operation where as the average life period of animal drawn cart is almost same. Maximum farmers (90%) involved themselves for the carting operation in both cases. The average cost of camel cart was high (about 40%) as compared to bullock cart. The average total number of working days in a year was almost equal in both type of carting system. The average weight/load carrying by camel cart (14.5 ± 4.89 quintal) was quite high as compared to bullock cart (8.00 ± 4.11 quintal). The average working hours per day were 9.25 ± 2.11 and 6.65 ± 2.50 for camel and bullock/respectively. The average daily income from camel carting was estimated to be higher (about 22%) than bullock carting. Total distance covered per day by camel cart (21.45 ± 6.55 km) was more as compared to bullock cart (14.85 ± 5.50 km). The camel carting required higher investment in terms of interest rate, depreciation rate and expenses towards insurances. The overall total fixed cost was high in camel carting (Rs. 3331/-) than bullock carting (Rs. 2438/-). The yearly repairing and maintenance cost of camel cart was high as compared to bullock cart. In case of bullock the total expenditure for shoeing was Rs. 800/- for a year where as it was not required at all for camel. The total variable cost was high in bullock carting than camel carting. The average yearly maintenance cost of animal were Rs. 15330/- and Rs. 14965/- for camel and bullock, respectively. The total expenditure for both cases was almost equal but total earning and profit from camel carting was quite high as compared to bullock. The payback period was almost double in case of bullock carting as compared to camel where as the benefit cost ratio was $3/4$ th time high in case of camel carting. It is evident that due to short pay back period and higher benefit cost ratio camel carting is profitable and advantageous over the bullock carting for small dry land farmer in the hot arid Thar Desert.



Muscular weakness and anorexia due to overload exertion in a camel: a case report

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Abstract

A camel aged 5 years and 10 months being trained for camel carting for 5 months and endurance training with slow increment of cart load for carting over a distance of 20 km at a stretch in 3½ hours on alternate days, developed muscular weakness, complete anorexia and inability to pull cart. This was found to be associated with a sudden incidental increment of cart load from 207-235% of body weight to 262% and 335% of body weight. Biochemical analysis revealed significant rise in creatine phosphokinase (CPK), creatinine and urea levels after incidental overloading. A significant rise in CPK, creatinine and urea during overload and persistence of higher levels over long period along with muscular weakness, inability to pull cart, sweating and anorexia indicated muscle dystrophy due to overload exertion.

Keywords: camel, CPK, exertion, muscular weakness



Indigenous formulation against mange in dromedary camel

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Abstract

Indigenous formulation comprising of locally available herbal ingredients was evaluated for its efficacy against naturally occurring cases of mange, caused by *Sarcoptes scabiei* in dromedary camel. The herbal preparation was capable of relieving the experimental animals from symptoms of-intense itching, scratching and biting, oozing of thick brown scabs in some cases, thickening and wrinkling of skin etc. Microscopically skin scraping became negative for parasites (mites/eggs/larvae) between 10th-15th day of its local application without any noticeable relapse even up to 30th day post treatment. Haematobiochemical examination failed to yield any significant diagnostic alteration except eosinophilia, hypoproteinaemia, hypoalbuminaemia and reverse trend of A/G ratio, which all together were restored after drug application.



Haematological and mineral values in mange affected and healthy camels

G. Mal, R. Kumar, D. S. Sena and M.S. Sahani

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Abstract

Study on hematological and mineral profiles in the mange infested and healthy camels were conducted. The mean values for Hb (%) neutrophils (%) and Fe level in the serum were decreased in mange affected camels.



Disease profile of Jaisalmeri camel in the breeding tract

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Abstract

Camel, a major source of biological energy in the Thar desert, is still being used by the poor people in the villages and cities to earn their livelihood. A survey was carried out to see the socioeconomic condition of the camel keepers and the health problems of Jaisalmeri camels. In all, 643 families belonging to 77 villages of 6 tehsils of Jaisalmer and Barmer districts were covered. The average annual income of the camel keepers was Rs. 22712/- and a family consisted of about 7 persons. It was revealed by the camel keepers that due to shrinkage of pasture land and mechanization during last more than a decade they are now maintaining only the required number of camels instead of a breeding herd. Due to this the average herd size reduced to 2.4 camels per herd. Of the 643 camel keepers, the information on important diseases prevalent in their herd was given by 314 camel owners. Mange was reported to be the major health problem (37.01 %) followed by digestive disorders (33.72%), which included tympany (16.32%), constipation (8.39%), abdominal pain (3.57%), diarrhoea (2.79%) and gastrointestinal obstruction (0.31 %). Trypanosomiasis was reported by 8.34% camel keepers. Other health problems included wound and abrasions (3.73%), saddle gall (3.42%), cataract (3.26%), kumari (1.39%), pneumonia (1.24%), lameness (0.93%), pica (0.93%), ectoparasite other than mange (0.62%), tumour (0.62%) and poisoning (0.62%). Of the 314 camel keepers, 70.06% first go for local treatment followed by allopathic treatment (21.33%) and herbal treatment (8.59%). The choice of line of treatment was observed to depend on the nature and severity of the disease and economic status of the farmer.

Keywords: Breeding tract, camel, disease, health, Jaisalmeri



Utilization of guar phalgati and groundnut haulms based complete feeds in camel calves

A.K. Nagpal and M. Arora

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Abstract

Ten male camel calves (2 years; 244-314 kg B. Wt.) were randomly distributed into 3 groups. Control group (C) of 4 animals was given mixed ration of guar phalgati and groundnut haulms (75:25). Experimental groups (CR I and CR II) having 3 animals each were given complete rations formulated from guar phalgati, groundnut haulms and feed ingredients in the ratios of 60:20:20 and 50:30:20 respectively. The DM intake was 84.07 ± 3.04 , 91.01 ± 2.41 and 84.45 ± 1.36 g/kg $w^{0.75}$ in group C, CR I and CR II respectively. Digestibility coefficients of organic matter were significantly ($P < 0.05$) higher in groups CR I & CR II than in control, however, ADF digestibility was lower ($P < 0.01$) in group CR II than in other groups. All the diets in 3 groups were able to meet TDN requirements. The DCP intake was insufficient and lower in C group than in other groups. In CR I and CR II groups, the DCP intakes were similar. It may be inferred that complete rations CR I and CR II could be utilized to meet the nutrient requirements of growing camel calves.

Key words: Guar phalgati, groundnut haulms, complete feed, digestibility, nutrient intake



Utilization of guar phalgati and tree leaves based complete diets in camel calves

A.K. Nagpal and M. Arora

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Abstract

The study was conducted to formulate economic complete feeds from local feed resources for camel calves. Camels fed on complete rations had higher DM intake, digestibility of proximate components except fibre contents. Camel calve: on these diets could meet the protein and energy requirements

Keywords: Complete ration, guar phalgati, nutrient utilization, tree leaves



Utilization of guar phalgati and tree leaves based mixed rations in camel calves

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Abstract

Eleven male camel calves (2-3 yr. age; 291-349 kg b.wt.) were randomly distributed into 3 groups. Group MR 1 of 4 animals was given ad lib., mixed ration of guar phalgati and ardu tree leaves in the ratio of 84:16 (w/w). Group MR 2 having 4 animals was given ad lib., mixed ration of guar phalgati and neem leaves in the ratio of 80:20 (w/w) and MR 3 group of 3 animals was fed ad lib., mixed ration consisting of guar phalgati and khejri leaves in the ratio of 76:24 (w/w). Average daily gain in body weight were 254.10, 241.80 and 311.48 g/d and statistically at par in group MR 1 to MR 3. The DM intake kg/100 kg body weight was 1.64 and 1.60 in MR 1 and 2 which was lower ($P<0.05$) than 1.83 in MR3. A significant ($P<0.05$) lower digestibility coefficients of OM, EE, CF, NDF and ADF were observed in MR 3 than the other 2 groups. The DCP and TDN intake/kg $W^{0.75}$ was 5.10 ± 0.10 and 4.84 ± 0.15 , 5.17 ± 0.05 and 43.40 ± 0.51 , 42.57 ± 1.08 and 45.34 ± 0.21 g in group MR 1, 2 and 3 respectively. Serum cholesterol was higher ($P<0.05$) in MR 2 than other groups. It may be inferred that mixed rations. MR 1-2 remained similar among 3 rations in terms of nutrient utilization and lower in MR 3 but the change in body weight during experiment was better in MR 3 than others.

Keywords: Guar phalgati, tree leaves, mixed rations, nutrient utilization.



Nutrient utilization of guar (*Cymopsis tetragonoloba*) phalgati based complete diet in camel calves

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Abstract

The voluntary intake and digestibility in two groups of camel calves given sole guar phalgati (group I) and complete diet (group II) was compared. The DMI kg/100 kg B.wt. was 2.03 and 2.32 in group I and II, respectively. The apparent digestibility of DM, OM, CP and NFE were significantly ($P < 0.05$) higher in group II than in group I. The DCP and TDN of group I and II were 209 and 305 gm, 3.386 and 4.027 kg, respectively. Serum profile was better in camel calves fed complete diet. It is thus indicated that feeding of complete feed improves nutrient digestibility, intake and serum biochemicals in camel calves although higher cost is involved.

Keywords: Camel calves, guar phalgati, complete feed, digestibility, serum metabolites.



Feed intake utilization and growth of camels maintained on all roughage or complete ration

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Abstract

Voluntary nutrient intake and mineral utilization was compared in two groups of camel calves (3.0 years, 340-390 kg b.wt.) given mixed ration (MR) consisting of groundnut haulms, khejri (75:25) leaves and complete ration (CR) consisting of groundnut haulms, dry khejri leaves, wheat straw and concentrate in the ratio of 32:25:30:13. The average daily gain and feed/efficiency ratio were 318, 432 g and 22.41, 16.76 in MR and CR respectively in 92 days feeding trial. The DMI and apparent digestibility of OM, CP and EE were higher ($P < 0.05$) in CR group than in MR. The DCP and TDN intake of group MR and CR were 3.45, 46.33 g and 5.37, 48.59 g/kg $W^{0.75}/d$ respectively; DCP intake being significantly higher in CR group. The absorption of Na, Ca, P and Mg were also higher ($P < 0.05$) in CR. Serum biochemical and electrolyte profile were similar between 2 groups. It is concluded that feeding of complete ration improved nutrient intake, digestibility and mineral absorption in camel calves although higher cost of feeding was involved.

Keywords: Camel calves, macrominerals, mixed and complete ration, nutrient intake serum biochemicals



Ultrasonographic imaging to monitor early pregnancy in the camel (*Camelus dromedarius*)

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Abstract

Six female one-humped camels of Bikaneri breed were mated with virile studs when follicles equal to or larger than 9 mm in diameter could be observed ultrasonographically. Real time B-mode ultrasound was used to detect and monitor the early conceptus, its growth and anatomical features between days 18 and 40 postmating. The embryonic vesicle and embryo proper within the vesicle were first visible on days 18 and 23 postmating, respectively. The heartbeat of the embryo proper could be detected on day 30. The allantois and amnion were first identified on day 40. The optic area was first identified on day 40 postmating. The ultrasonography method can help to identify pregnant or nonpregnant she-camels as early as day 20 of pregnancy, the results being available instantaneously.

Keywords: *Camelus dromedarius*, Bikaneri, dromedary, echography, fetus, pregnancy diagnosis reproduction



Sustainability of pastoralists through camel management in hot arid Thar desert

C. Bhakat

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Abstract

Camel-carts continue to play a crucial role in the Indian farm economy as a cheap mode of transportation of different agricultural commodities. In Thar region the ratio of camel to other herbivore (cattle, buffalo, sheep and goat) was 1 : 21.36. Among the different camel health disorders, parasitic mange case was highest. It was followed by Trypanosomiasis, general fever, respiratory infection, other problems viz. digestive disorders, worm etc. The average annual productivity of commonly grown Thar desert crop were 0.489 tonne/ha for clusterbean (*Cyamopsis tetragonoloba*) and 0.275 tonne/ha for moth (*Vigna aconitifolia*). The final return per unit (Rupee) invested was high in clusterbean (Rs 3.36) as compared to moth (Rs 2.29). The average cost of rearing of draft camel was low when compared with cattle and buffalo. The final return per unit (rupee) invested was high in camel (Rs 1.90) when compared with cattle and buffalo (Rs 1.82) in Thar desert. Due to higher production potential, increase market price and economic advantage clusterbean cultivation for camel farmers is more profitable than moth cultivation, and camel rearing is also profitable when compared with other livestock rearing in terms of per unit investment.

Keywords: Camels, farm management, pastoralists, sustainability



Effect of camel milk on glycemic control, risk factors and diabetes quality of life in type-1 diabetes: a randomized prospective controlled study

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Abstract

The efficacy of camel milk on glycemic control risk factors and diabetes quality of life in patients of type 1 diabetes was evaluated. Twenty four randomly selected patients with type 1 diabetes were enrolled in the study. These patients were divided into two groups. Group 1 (N=12) received usual care (diet, exercise and insulin) and group 2 (N=12) received 500 ml camel milk in addition to usual care for 3 months. Frequent blood sugar monitoring was done to maintain euglycemia by titrating the doses of insulin. HbA_{1c}, Lipid profile, plasma insulin and c-peptide estimation was done at the beginning and after 3 months. BMI, diabetes quality of life questionnaire were prepared every week. In each visit patient was asked for any untoward effects after starting camel milk.

Baseline data of both the groups were similar in demographic and clinical variables. After 3 months of treatment there was a significant improvement in fasting blood sugar (115.66 ± 7.17 to 100 ± 16.2 , $p < 0.002$) and HbA_{1c} levels (9.54 ± 2.1 to 9.08 ± 1.77 , $p < 0.002$) and significant reduction in insulin requirement (mean doses of insulin 41.16 ± 10.32 to 30 ± 12.6 , $p < 0.002$) in patients receiving camel milk. Diabetes quality of life score improved significantly in the form of change in satisfaction score from 28 ± 5.16 to 22.5 ± 3.96 ($p < 0.002$), impact score from 34 ± 4.84 to 28.08 ± 5.26 ($p < 0.003$) and worry score from 15.5 ± 3.2 to 11.91 ± 1.24 ($p < 0.002$). There was 30% reduction in doses of insulin in 92% of patients of group 2. However, there was no statistically significant changes in lipid profile plasma, insulin and c-peptide.

Camel milk proved effective supplementation in the management of type 1 diabetes as there was significant reduction in doses of insulin along with betterment in BMI, diabetes quality of life however, there was no change in lipid profile and insulin levels

Keywords: Alternative therapy, camel milk, diabetes quality of life questionnaire, glycemic control, type 1 diabetes.



Effect of camel milk on glycemic control, lipid profile and diabetes quality of life in type 1 diabetes: A randomised prospective controlled cross over study

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Abstract

The effects of camel milk on glycemic control, lipid profile and diabetes quality of life in type 1 diabetic patients, were evaluated randomly selected type 1 diabetic patients (24) were divided into 2 groups. Group 1 (N=12) received usual care i.e. standardized diet, standardized exercise regimen and insulin for 3 months. Then camel milk (500 ml) was added for next 3 months. Patients of group 2 (N=12) received camel milk (500 ml) and usual care for first 3 months and only usual care in next 3 months. Frequent blood glucose monitoring was done to keep euglycemic status by titrating the dose of insulin. Analysis of HbA1c, lipid profile, insulin and C-peptide was done in the beginning, at the end of third and sixth month. In group 1 patients the requirement of insulin was 40.83'7.12 at the beginning, 41.67'5.49 after 3 months and it reduced to 26.83'8.44, (P<0.05) after camel milk supplementation. In group 2 dose of insulin increased from 30.00'13.01 to 40.57'15.20 when camel milk was withdrawn. Improvement was observed in glycemic control; in group I HbA1c reduced from 9.48'2.17 to 8.19'1.84 and in group 2 HbA1c decreased from 9.59'1.62 to 8.02'1.17. Statistically significant improvement was seen in D.Q.L. score. It is concluded that moderate intake of camel milk will reduce the insulin requirement with better glycemic control and diabetes quality of life without affecting lipid profile



An economic intervention of use of Indian dromedary camel in desert ecosystem

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Abstract

A meticulous grass root level survey study was conducted on various aspects of use of camel which involved four different zones (north, south, east, west) of desert ecosystem. The statistically analysed data revealed that average cost of camel cart was higher than those for farm implements. The average total number of working days in a year was more in carting operation than farming use. The average load carrying by camel cart was 18.47 ± 3.71 quintal/trip. The camel carting required higher investment in terms of interest rate, depreciation rate and expenses towards insurance than farming use. The overall total fixed cost was high in camel carting than farming use. The yearly repairing and maintenance cost of camel cart was high as compared to maintenance of implements. The total variable cost was high in farming use than carting. The total expenditure for both cases was almost equal but total earning and profit from camel carting was high as compared to farming use. The pay back period was less and cost benefit ratio was high in both cases of carting and farming use of camel. The study concluded that due to short pay back period and higher cost-benefit ratio, carting and farming use of camel is profitable and advantageous for small dry land farmers in the hot arid desert ecosystem.

Keywords: Camel, carting, farming, economics, management



Studies on farming use of camel and bullock system in hot arid villages of Thar desert

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Abstract

A survey was carried out on the farming use of camel Vs. bullock system covering four zones of Thar desert. A detail economics of both type of farming systems were analysed by using the linear programming method. The average age (years) of camel and bullocks used under farming system were 6.43 ± 0.98 and 4.12 ± 0.76 respectively. Annual average net income from kharif season crop was observed to be higher in camel system as compared to bullock system. Overall in the study area maximum camel were reared under intensive system followed by semi - intensive and extensive system. Among the *kharif* season crops, ground nut provided higher return per rupee investment, followed by guar, cotton and moth whereas among the *rabi* season crops, mustard provided higher return per rupee investment, followed by gram and wheat. The farming use of bullock system required higher expenditure in terms of interest on investment, depreciation and expenses towards insurance of animals. Similar trend was observed in overall total fixed cost, overall total variable cost and maintenance cost of animal. The overall total variable cost was quite high in bullock system (Rs. 56,306/-) as compared to camel system (Rs. 37,442/-). The average earning from selling of manure was more in bullock system than camel system whereas income from other sources and profit was high in camel system than bullock system. The pay back period for investment on animal system was quite less in case of camel than bullock but the cost benefit ratio was high in camel system as compared to bullock system. It is evident that due to higher cost benefit ratio and shorter pay back period the farming use of camel system is advantageous and profitable over the bullock system for small and medium farmers in the hot arid Thar region.



Annual hair yield attribute in indigenous camel breeds

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Abstract

The camel hair and its products can be an important source, of additional income for camel keepers. Yearly hair production data from 816 Indian dromedary camels belonging to 3 elite breeds that belong to 5 different age groups were recorded for 4 different years. The mean annual hair production varied from 0.547 ± 0.015 kg {above 6 year age group} to 1.076 ± 0.025 kg (3 year age group). The Bikaneri breed of camel produced maximum annual hair yield followed by Jaisalmeri and Kachchhi breed. The least square analysis indicated significant ($P < 0.01$) effect of breed factors on annual hair production. The male camel produced significantly ($P < 0.01$) heavier annual hair clip than female in all breeds and all age group cases. Annual hair yield was significantly ($P < 0.01$) influenced by sex factor. The highest annual hair production was observed in 3 year age group followed by 2, 4, 6, 1 year and 6 years age group. Age of camel had a significant ($P < 0.01$) effect on annual hair production. The interaction between genetic group and sex was significant ($P < 0.05$) on annual hair production.

Keywords: Camel, dromedary, hair production



Semen collection, cryopreservation and artificial insemination in the dromedary camel

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Abstract

Collection of semen with a bovine artificial vagina (AV) was attempted with each of 14 camels over a period of 2 years. Semen samples were evaluated, extended and cryopreserved. Frozen thawed semen, diluted cooled semen or whole semen was used to inseminate some female camels which were induced to ovulate with hCG. Males ejaculated semen into the AV in 74.6% collection attempts. The male copulated for at least 200 s in 62.9% attempts. The remaining copulations were of shorter duration. Similarly 49.3% ejaculates were at least 3 ml of semen. Libido and donation of semen improved from December onwards and reached a peak after mid January with peak performance persisting until April. It declined during May. The majority of camels had lost libido and refused to donate semen by the end of May. Camel semen is in gel form. While 35.9% of 203 semen samples exhibited no individual sperm motility, 28.5% exhibited low to fair grade individual sperm motility and only 35.4% exhibited >50% sperm motility. Differences existed between animals ($P < 0.01$) and months ($P < 0.05$) of collection, while effect of copulation time was not significant. Mass motility was not observed in camel semen. Individual sperm motility develops after liquefaction of semen. Addition of caffeine but not chymotrypsin improved the individual motility. The mean live percent sperm count and normal acrosome were 73.3 ± 1.0 and 92.0 ± 0.5 , respectively. Only 51.1% of 45 semen samples with pre-freeze motility of >50% and 25% of 16 semen samples from low pre-freeze motility group with an overall success of 44.2% of 61 semen samples were successfully preserved. Wide variation was observed in the freezability of semen from different males. Attempts to impregnate female camels with liquid semen, frozen thawed semen and whole semen after hCG induced ovulation resulted in 0/10, 1/13 and 4/10 pregnancies.

Keywords: Semen characteristics, cryopreservation, artificial insemination, camel, *Camelus dromedarius*



Herbal formulation in the management of camel pox

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Abstract

In the process of scientific evaluation and validation of ethno veterinary medicine, a herbal formulation developed for other skin diseases of camel, was used as therapeutic agent on naturally occurring cases of camel pox and compared for its efficacy with standard and commonly used allopathic treatment. The present herbal formulation was assessed to be a comparable therapeutic modality with allopathic treatment with a superiority of reduced or no ramnances of pox healed lesions.

Keywords: Camel, pox, herbal



Analysis of causes of death in camel

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Abstract

The causes of death in camel, and effect of breed sex and age on mortality were studied. In all 1824 records belonging to the centre's herd were analysed. The mortality was highest in Arab cross (16.83%) followed by Kachchhi (14.07%), Bikaneri (10.35%) and Jaisalmeri (9.76%). The mortality was significantly ($P < 0.05$) higher in males (13.10%) than females (9.51%). Highly significant effect ($P < 0.01$) of age group on mortality was observed, Maximum mortality (48.78%) was due to the involvement of digestive system. Respiratory system was involved in 17.56% cases. The nervous system was involved in 4.88% cases whereas the cardiovascular, urinary and genital system were involved in 4.39, 0.44 and 0.44% cases, Deaths in 23.41 % cases were due to poisoning, euthanasia due to fracture of long bones/incurable disease, pica etc. Improved management practices, cost effective management of long bone fractures and supplementary feeding can be of great use in reducing the mortality in young and adult camels.

Keywords: Camel, diseases, health



Utilization of mixed and complete rations by lactating camels

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Abstract

Seven lactating camels (B. Wt 516.00±20.92 kg) in their second/third lactation were randomly divided into two groups. First group 'MR' of 3 camels was fed on mixed ration consisting of dry moth chara, dry khejri leaves and mineral mixture (74.3: 25.0 : 0.7) while second group 'CR' of 4 camels was fed on complete ration consisting of dry moth chara, khejri, wheat straw and concentrate ingredients (35.3: 25.0: 30.0: 9.7) for a period of 92 days. The MR lost 332.5g/d body weight while CR could achieve ADG of only 27.2 g/d. Significantly higher ($P<0.01$) digestibility of CP and EE were observed in CR as compared to MR camels. The DCP and TDN intakes ($\text{g/kg W}^{0.75}$) were 10.51 and 89.32g respectively in CR which were significantly higher ($P<0.01$) than the respective values of 4.88 and 63.83g in MR. The apparent absorption of sodium, potassium, calcium and phosphorus were similar between 2 groups except magnesium which was higher ($P<0.01$) in MR. Serum biochemicals and electrolytes did not differ between 2 groups except serum magnesium. It was significantly ($P<0.01$) higher in MR than CR which could be attributed to higher ($P<0.01$) Mg absorption (65%). It was concluded that feeding of complete ration maintained body weights, milk yield and improved nutrient utilization in lactating camels although higher cost was involved.

Keywords: Digestibility, lactating camels, macro-minerals, mixed and complete feed, serum biochemical



Utilization of *moth chara*, wheat straw and *bui* leaves based complete rations in camel calves

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Abstract

Male camel calves (11) (approximately 2.5 years-old; 308-364 kg) were randomly distributed into 3 groups. Control group (C) of 3 animals was given sole roughage ration of *moth chara* (*Phaseolus aconitifolius*). Experimental group of CR (complete ration) I having 4 animals was given complete ration formulated from *moth chara*, wheat straw (*Triticum vulgare*) and concentrate in the ratios of 47: 40: 13 and group CR 2 was given complete ration consisting of *moth chara. bui* (*Aerva tomentosa*) leaves, wheat straw and concentrate in the ratio of 27: 20: 40: 13. The average daily gain and feed/ body weight gain was 162, 268, 217 g and 38, 24, 28 in C, CR 1 and CR 2 in 113 days with 1.56, 1.81, 1.60 kg DM intake /100 kg body weight or 67.85, 78.53, 69.23 g/kg $W^{0.75}$ respectively. Digestibility coefficients of various proximate, components differed significantly ($P < 0.05$), except that for CP and CF. The OCP intake was 4.42, 4.74, 4.63 g without any significant difference between treatments; and TDN intake was 41.17, 43.74, 39.06 g/kg $W^{0.75}$ in group C, CR I and CR 2 respectively, which differed significantly. The absorption of Na, K, Ca, P and Mg was differ ($P < 0.05$) among 3 groups and was related to their intakes from feeds and water. No significant difference was observed among 3 groups for serum glucose, total protein, Cl, Ca, P and Mg indicating effective homeostasis in camels.

Keywords: Animal nutrition, *Bui* leaves, camel, complete feed, mineral absorption, nutrient intake, serum profile, wheat straw



Improvement in reproductive efficiency in farm camels under hot arid region

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Abstract

Number of matings during the follicular cycle and data on conception rate were collected and analysed in indigenous camels (Bikaneri, Jaisalmeri and Kachchi breeds) managed under semi-intensive system. Ovarian activity during breeding and non-breeding season was examined ultrasonographically. It was revealed that follicular growth and regression is a gradual and sequential process in absence of ovulation. Apart from breeding season follicular growth was also observed in 50 percent of the camels during non-breeding season. The mean conception percentage under single mating, 2 matings at an interval of 24 and 48 hours from 1991 -92 to 1997-98 did not show significant variation in Bikaneri, Jaisalmeri and Kachchi breed with conception of 60.14, 53.12 and 56.94 percent respectively and a overall conception of 56.85 percent, where as the mean percent conception with 2 matings at 72 hr interval during the follicular cycle in Bikaneri, Jaisalmeri and Kachchi was 80.0, 72 and 71.43 percent respectively with overall conception 75.8 percent. An improvement of about 10 to 15 percent could be observed in conception rate when given 2 matings at interval of 72 hours as compared to single mating and 2 matings at an interval of 24 to 48 hours.

Keywords: Camel, dromedary, reproductive efficiency, ultrasonography, conception rate.



Prevalence, characterisation and antibiotic sensitivity of intramammary infections in camel

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Abstract

A total of 282 quarters milk samples were examined from 71 apparently healthy camels by cultural examination and somatic cell count to know the prevalence of non-clinical mastitis in this species. Out of these 39.72% (112/282) of quarters were culturally positive. Whereas, 65.60% (185/282) had somatic cell count (SCC) more than 50000 per ml of milk. Of these, 34.40% (97/282) and 5.32% (15/282) were having 'subclinical (culturally +ve and SCC>500000/ml)' and 'Latent (culturally +ve and SCC<500000/ml)' mastitis, respectively according to the International Dairy Federation criteria adopted for cattle. While 31.20% of the quarters were having nonspecific (culturally -ve and SCC>500000/ml) mastitis. No apparent difference was observed between fore and hind quarters as regards to both infection level as well as elevation of SCC. Mean pH of quarter milk samples was within the normal range in all the non clinical quarters, however, in case of clinically infected quarters there was a significant rise in the mean pH (7.19).

Staphylococcus epidermidis was the most predominant (27.83%) organism followed by unclassified *streptococci* (20.87%), *Staph. aureus* (20.0%), *Str. agalactiae* (10.43%), *Str. dysgalactiae* (10.43%), *Corynebacterium* spp. (9.57%) and *Bacillus* spp. (0.87%). Amongst *Staph. aureus* strains 82.61 % were associated with a SCC>500000/ml. Similarly, *Staph. epidermidis* 90%, *Str. agalactiae* 58.33%, *Str. dysgalactiae*, 100%; unclassified *streptococci*, 91.66%, *Corynebacterium* spp. 81.81 % and *Bacillus* spp. 100%, respectively, were associated with SCC>500000 per ml. The mean SCC for the above pathogens was 11.1×10^5 , 19.5×10^5 , 11.7×10^5 , 10.7×10^5 , 12.4×10^5 , 8.2×10^5 and 9.2×10^5 , respectively.

A total of 55 isolates of staphylococci including 23 coagulase-positive isolates from camel intramammary infections were characterised by different biochemical tests. The different species of staphylococci identified in order of their frequency were *Staph. aureus* (30.91%), *Staph. hyicus* (10.91%), *Staph. intermedius* (7.27%), *Staph. haemolyticus* (7.27%), *Staph. auricularis* (7.27%), *Staph. sciuri* (7.27%), *Staph. hominis* (5.45%), *Staph. epidermidis* (3.64%), *Staph. capitis* (1.82%) and *Staph. warneri* (1.82%). Out of 55 isolates 9 isolates could not be identified with the present identification system used. All of these species were associated with raised SCC of milk.

As many as 114 isolates recovered from intramammary infections in camels were subjected to in vitro chemotherapeutic sensitivity testing by the disc-diffusion method using 19 antimicrobials. The isolates comprised of *Staph. aureus* (23), *Staph. epidermidis* (32), *Str. agalactiae* (12), *Str. dysgalactiae* (12), unclassified *streptococci* (24) and *Corynebacterium* spp. (11). Variable chemotherapeutic sensitivity pattern was observed for different species of organisms. In considering overall efficacy, irrespective of the species of the organisms, 100% of the isolates were sensitive to chloramphenicol, cephalixin, amoxicillin, and amoxycylav. More than 90% were sensitive to tetracycline, oxytetracycline, cloxacillin, gentamicin, ciprofloxacin, lincomycin and penicillin. Sensitivity to kanamycin, polymyxin-b, nitrofurantoin, neomycin, and ampicillin was more than 80%. Whereas 79.8, 76.3 and 72.8% of the isolates were sensitive to spiramycin, erythromycin and furazolidone, respectively.

Keywords: Antibiotic sensitivity, camel, characterisation, intramammary infections, prevalence, *Staphylococcus* species



Influence of camel management systems on the sustainability of small farmers in hot arid region of Thar desert

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Abstract

Information on camel management and trading systems were collected from 104 camel keepers, representing different villages and bringing 262 camels at the Ramdev Animal fair (Nagour, Rajasthan) and a total of 32 complete transaction cases were recorded. Majority of the farmers present at the fair were from Rajasthan (90%). Ten different categories of farmers were recorded. Most of the camel keepers who were interviewed were farmers (91%). Nevertheless 9% also claimed to be camel businessmen. The transaction of camel indicated higher number of male (52%) as compared to female camel (48%). Camel of above 7-year age group was the most representative with 57 % of all the camels. The distribution of camel among the various farmers (came with camel for sale) was not uniform. It ranged from 0 camel to 12 camel per farmer. The representation of Bikaneri breed (90%) was predominant. The average number of camel owned per farmer at the village level was 4.90 ± 2.67 . The average number of camel brought for sale was 2.54 ± 1.11 . The average cost of camel varied according to age and sex. The average, expected cost, prior to sale was Rs. 9654 ± 287 , whereas, the average actual cost of the transaction was Rs. 8768 ± 165 . The cost at sale was 90% of the expected cost, which, shows: that farmers achieved cost very nearer to their expectation.

Keywords: Camel, trading, management, economics sustainability



Losses of female camel calves at different ages from birth to age at first calving

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Abstract

Postnatal losses in camel are more frequent than in other domesticated livestock species. In literature, calf losses have been noted in the range of 20-40%. The present study was undertaken to study the post calving losses of female calves from birth to age at first calving at different ages. The female calf mortality from birth to age at first calving (AFC) at different ages 0 to 3 months, 3 months to 1 year, 1 to 2 years, 2 to 3 years and 3 years to AFC were 8.6, 3.3, 5.3, 4.7 and 5%. Total mortality was 21.89% before they reached the age at first calving. Period of birth have significant effect on mortality in 3 months to 1 year and 1 to 2 year-age group. Month of birth had significant effect on mortality at 0 to 3 months and 2 to 3 years. The culling of female calves from birth to AFC at different ages 0 to 3 month, 3 months to 1 year, 1 to 2 years, 2 to 3 years and 3 years to AFC were observed as 0.18, 7.2, 11.9, 12.4 and 14.7% respectively. About 33% of the female calves born were culled due to different reasons congenital defects, deformities, poor growth rate or late maturity etc., before they reached the breeding herd. Period of birth significantly affect culling in 3 months to 1 year, 1 to 2 years and 2 to 3 years age group. The month of birth had highly significant effect only upon culling in 1 to 2 year age group.

Keywords: Age at first calving, animal production, birth, camels, mortality



Camel- a better alternative than bullock system in Thar desert

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Abstract

Camel are life-line of the rural population in the remote village of Thar desert. It also provides more income and employment to the youth of farmer's family. The animal wealth of the farmers can be utilized efficiently and preserved as a fixed asset, which is a symbol of dignity, social prestige and pride to the farming community. This study creates awareness among the otherwise ignorant farmers regarding the benefit of farming use of camel over the bullock system. Due to higher cost: benefit ratio and shorter pay-back period, the farming use of camel system is beneficial and profitable over the bullock system for small and medium category farmers in the hot arid Thar region



Pattern of utilization and potentiality of camel skin

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Abstract

Today camel skin are utilized for preparation of a variety of consumer goods in few regions of Rajasthan (Jaisalmer, Barmer) and Gujarat but in olden days camel hide were popularly utilized for storing ghee and oil under village conditions. Skin of young calves are useful for making fur and those of adults for leather. The epidermis of camelid is usually composed of stratum corneum, s. lucidum, s. granulosum, s. spinosum and s. germinativum. The dermis consist of superficial layer, mid-dermis and hypodermis. Flaying of camel hides is generally done manually to get raw hide which are mostly cured by air-drying. The semi-dried camel calf skins have to pass through some chemical and mechanical treatments before they get actually converted into a fur, viz. soaking, removal of flesh, pickling, tanning, fatliquored and finally washed and dried. Additional operations in making leather are treatments of cured camel hides with liming process, bating process, dyeing and lacquer finishing. There is a great potentiality of utilization of camel skin as furs. The cost of small article varies from Rs 500 to Rs 3000, whereas the cost of big item varies from Rs 10 000 to Rs 12 000. Attention has also been paid to explore the possibilities for modern use with the help of newer technology, in addition to the traditional uses too.



Studies on behavioural pattern of adult camel in different systems of management

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Abstract

Seven adult female camels (6 to 7 year age) were selected and kept in switch over design in two different systems of management like loose housing (L.H.) and semi-intensive system (S.I.) for two months. Different behavioural patterns exhibited by camels were recorded throughout the period. The analysis of data revealed that total average time involved in feed intake was more (327.53 ± 2.92 min.) in S.I. condition than L.H. condition. The total average time involved in rumination was more in S.I. (439.78 min.) than L.H. (422.78 min.) system. The nocturnal rumination time is maximum as compared to day time rumination in both systems of management. The total average time involved in sleeping is more in S.I than L.H. condition. The total average time for idling was less in S.I than L.H. condition. The total average frequency of defecation and urination of adult camel were more in night than day time in all systems of management. The total average frequency of agonistic behaviour of camel were less in S.I. than L.H. condition. The study concludes that due to higher time involvement in feeding and other related activities and less time involvement in idling like activity semi-intensive system is better than intensive system for adult camel management.



Studies on behavioural pattern of camel calf in different systems of management

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Abstract

Seven camel calves (Bikaneri breed) were selected just after birth and kept in two different systems of management like Loose Housing (L.H)/ Intensive (I) system and Semi-intensive system (S.I.) for two months. Different behavioural patterns exhibited by camel calves were recorded throughout the 24 hours period for seven complete days in a month in each group at 15 minutes interval in a special type of score card developed for this purpose. The analysis of data revealed that total average time involved in feed intake/milk suckling was more (174.92 ± 1.85 min.) in S.I than L.H condition. The total average time involved in rumination was in S.I (123.20 min.) system. The nocturnal rumination time is maximum as compared to day time rumination. The total average time involved in sleeping is more in LH than S.I. system. The total average time for idling was less in S.I. than L.H. condition. The total average frequency of defecation and urination of camel calves were more in night than day time in all systems of management. The total average frequency of agonistic behaviour of camel calves were less in S.I. than L.H. condition. The average attempt for drinking was almost similar type in L.H (1.32 ± 0.11) and S.I conditions (2.86 ± 0.17). The study concludes that due to higher time involvement in feeding and other related activities and less time involvement in idling like activity semi-intensive system is better than intensive system for camel calf management.



Studies on camel management under various microenvironment of shelter systems

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Abstract

An investigation was carried out on three male Jaisalmeri camels which were allotted randomly into three comparable shelters in switch over design for 21 final trial days. Three different type of shelters were, 1-Thatched roofed open type kuchchha shelter (TROTK) 2- Asbestos roof close type concrete shelter (ARCTC). 3 - Loose housing system. Temperature humidity index was higher in macro-environment followed by asbestos roofed, loose house and thatched roofed shelter. The cardinal physiological responses during morning and evening time under three shelters, were significantly correlated ($P < 0.01$). Rectal temperature, pulse rate and respiration rate during evening and morning under 3 treatment groups differed significantly ($P < 0.01$). All cardinal physiological responses were significantly ($P < 0.01$) increased after work as compared to pre-work condition. The levels of blood creatinine, and urea were found comparatively lower in the morning than in the evening, while glucose and triglycerides were observed higher in all three shelter groups. The highest percent decrease in bath glucose and triglycerides values were found in the evening under ARCTC, tree shelter, TROTK. Overall thatched roofed open type kuchchha shelter is the most economical, followed by loose housing and the asbestos roof close type concrete shelter.

Keywords: Camel, Shelter Management, Microenvironment, Physiological response.



Prevalence, etiology and Antibioqram of subclinical mastitis isolates from camel

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Abstract

A total of 100-quarter milk samples from 25 apparently healthy camels were collected and subjected to culture examination to find out the prevalence of subclinical mastitis, and to determine the bacterial isolates associated with subclinical mastitis in camels. The *in vitro* antibiotic sensitivity pattern against these bacterial isolates was also studied. The prevalence of subclinical mastitis was found to be 41 per cent on quarter basis and 72 per cent on animals basis. Staphylococci were the most prevalent organisms (68.29 per cent) among bacterial isolates followed by Streptococci (19.51 per cent), *Corynebacterium* spp. (7.32 per cent) and *Bacillus* spp. (4.68 per cent). *In vitro* antibiotic sensitivity of 41 isolates against 10 antimicrobials revealed more than 95 per cent sensitivity for chloramphenicol, ceftriaxone, amoxycillin, cloxacillin, enrofloxacin and ciprofloxacin



Therapeutic efficacy of enrofloxacin alone and in combination with levamisole in subclinical mastitis in camel

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Abstract

A total of 100-quarter milk samples were collected from 25 lactating she camels in sterilised test tubes and were subjected to Culture test, California Mastitis Test (CMT), Somatic Cell Count (SCC), pH, and Electrical Conductivity (EC) test before giving the treatment and then after fourth day following the treatment course to study the therapeutic efficacy of enrofloxacin as systemic therapy alone and in combination with levamisole in subclinical mastitis in camel. Treatment both with enrofloxacin alone and in combination with levamisole was effective in controlling subclinical mastitis in camel but the use of levamisole did not seem to increase the therapeutic efficacy of Enrofloxacin significantly.

Keywords: Camel, enrofloxacin, levamisole, subclinical mastitis, therapeutic efficacy



Explanation of no or low sperm motility in camel semen

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Abstract

The study on collection and evaluation of camel semen was undertaken with a view to assess possible causes of low sperm motility in this species with an special emphasis on possibility of toxic effect of rubber funnel contact with camel semen. Besides, collection of semen over several years with traditional rubber funnel type of artificial vagina (AV), a separate experiment was conducted on 6 camels which were used for 114 semen collections alternately with AV assembled as traditional rubber funnel (n=63) or with camel collection glass (n=51).

Microscopic examinations of semen revealed that spermatozoa are densely clustered and entrapped. Initially they are not free to move. Sometime later, they can oscillate their tails only. Diluted and chilled semen mixed gently and examined under microscope presents a heterogeneous picture. In certain fields of microscopic glass slide sperms are clustered and entrapped, while at other fields sperms are free and progressively motile. A microscopic picture revealed that the heads of spermatozoa are embedded, tightly secured, appears to have glued together and tails only vibrating strongly. Some process of liquefaction of semen coagulum releases spermatozoa in batches which develop progressive motility.

Semen samples collected either with traditional rubber funnel type AV or carnal collection glass did not differ in % motility as revealed by t-test.

It is concluded that low sperm motility is due to coagulation of semen and entrapment of spermatozoa. Rubber funnel contact apparently did not affect motility to any significant extent.

Keywords: Camel collection glass, sperm motility.



Refrigeratory preservation of camel semen

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Abstract

A total of 28 semen samples were collected from 6 males, each ejaculate was split into two and extended with Tris and Biociphos dilutors, respectively. The semen samples were extended at room temperature and were slowly cooled to 4°C. The individual sperm motility was recorded at 0, 24, 48, 72, 96 and 120 hours or till the motility ceased. None of the 28 samples extended in Biociphos could retain motility at 24 hours after collection while 11/28 (39.28%), 10/28 (35.71%), 5/28 (17.85%) and 3/28 (10.71 %) semen samples extended in Tris could retain motility for 24, 48, 72 and 96 hours, respectively. The study was then continued with Tris buffer and 66 more semen samples (totaling 94) were extended and evaluated for preservability of sperm motility. The results indicated that 76/94 (80.85%), 35/94 (37.23%), 25/94 (26.59%), 9/94 (9.57%), 5/94 (5.32%) and 1/94 (1.06%) samples extended in Tris could retain motility for 0, 24, 48, 72, 96 and 120 hours, respectively. It is concluded that Biociphos is not a suitable extender for preservation of camel semen and preservability is also low in Tris extender. The composition of Tris buffer need to be modified for improving preservability of camel semen.

Keyword: Camel, semen preservation, Tris and Biociphos extenders.



Management of sarcopticosis in one humped camel –a comparative study

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Abstract

In an attempt to evaluate therapeutic efficacy of Indigenous formulation with and with out immunomodulator against mange in one humped camel and compare its clinical action with commonly used allopathic drug, an indigenous formulation was put on trial using house hold kitchen ingredients on naturally occurring clinical cases of Sarcopoticosis. The drug was found to be effective mangicidal and comparable to allopathic drug with superiority of having good nourishing tonic effect on skin. Simultaneous use of levamisole apparently could not be of much value. Recovery from clinical symptoms was effective noticeable observation apart from skin scrapping examination which further confirmed the miticidal action of the drug. Reversible trends of eosinophilia, hypoproteinemia, hypoalbuminemia and A:G ratio and unaltered values of transminases were the laboratory findings suggestive of a bit freedom from toxicity.



A therapeutic approach to Sarcopticosis through indigenous medicine in dromedary camel

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Abstract

In naturally occurring cases of Sarcopoticosis in dromedary camel an indigenous formulation 1 comprising of commonly available ingredients was tried for its therapeutic efficacy. The local application of drug was found to be an effective mangicidal anti good nourishing tonic for skin as none of the skin scraping examinations could record presence of parasites (mites/eggs) even on 30th day post application and recovery from various symptoms such as itching, thickening and wrinkling of skin etc. was gradual but appreciable. Reversible trend of eosinophilia, hypoproteinemia. hypoalbuminemia and A/G ratio and transminases further confirmed the therapeutic efficacy in addition to help in ruling out of any undesired allergic or harmful effect of drug on animals.



Miticidal properties of a herbal formulation on camel

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Abstract

Plants have a long back therapeutic history in the Indian context making a subclass as medicinal plants from which an formulation was developed on a basic concept of ethno medicine and evaluated for its miticidal activity on camel which seem to yield very good, encouraging and promising results.



Genetic characterisation of Jaisalmeri camel using microsatellite markers

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Abstract

Six New World Camelidae microsatellite primer pairs were used to investigate the genetic polymorphism in Jaisalmeri camel. Polymerase chain reactions were carried out for 30 unrelated camels of Jaisalmeri breed. The amplification products were resolved in 6% (denaturing) urea PAGE and stained with silver nitrate. All six microsatellite primer pairs were found polymorphic in Jaisalmeri camel. The number of alleles ranged from 2 to 5. The expected heterozygosity ranged from 0.32 to 0.651 and the polymorphic information content ranged from 0.268 to 0.588. The results indicated the utility of these microsatellite loci for studying genetic polymorphism in dromedary breeds.

Keywords: Breed, camel, characterization, Jaisalmeri, Microsatellite



Nutrient utilization in camel fed sewan (*Lasiurus indicus*) grass with or without ardu (*Ailanthus excels*) leaves

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Abstract

Young Bikaneri camels (5; 2 yrs old; 297.2 ± 8.6 kg BW) were offered dry chaffed sewan (*Lasiurus indicus*) grass *ad lib* in phase I for 30 days followed by supplementation of dry Ardu (*Ailanthus excels*) leaves @ 1.0 kg/head/d in phase II for 30 days. The DM intake in phase I was 2.19 ± 0.22 kg/d or 0.78 ± 0.08 % BW which increased to 3.36 ± 0.12 kg/d or 1.18 % BW in phase II. Supplementation also improved ($P < 0.01$) DM digestibility 9.52 ± 15.64 % in phase I to 45.34 ± 1.67 % in phase II. Significant ($P < 0.01$) increase in DCP and ME intake was observed on ardu leaves supplementation to sewan grass in phase II. Water intake was also higher in phase II (7.83 ± 0.6 l/d) than in phase I (6.47 ± 0.89 l/d). No significant difference was observed between 2 phases in respect of serum glucose, total protein, albumin, urea, cholesterol, triglycerides, sodium, potassium, chloride, calcium except phosphorus. The results indicated the beneficial effort of tree leaves supplementation on nutrient utilization and growth in young camels fed only grass diet.

Key words: Ardu, Sewan, camel calves, digestibility, serum profile.



Mineral antioxidant status in serum and its relationship with somatic cell count in camel milk

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Abstract

Serum Zn, Cu, Co and Fe concentration was estimated in lactating camels having different types of mastitis. Mean serum Zn, Cu and Fe concentration varied non-significantly between negative, subclinical, nonspecific and clinical groups ($P < 0.05$). However, Co concentrations in these groups were 1.78 ± 0.12 , 1.34 ± 0.18 , 1.26 ± 0.10 and 0.70 ± 0.41 $\mu\text{g/ml}$, respectively which were statistically significant among groups ($P < 0.05$).

Mean serum Zn, Cu, Co and Fe status of animals having SCC upto 2.0, 2.0-5.0, 5.0-10.0 and > 10 lacs were 1.30 ± 0.60 , 1.56 ± 0.16 , 2.42 ± 0.84 and 1.78 ± 0.12 ; 2.37 ± 0.32 , 1.35 ± 0.08 , 3.93 ± 0.46 and 1.26 ± 0.10 ; 2.45 ± 0.51 , 0.95 ± 0.14 , 2.77 ± 0.71 and 1.41 ± 0.16 ; 2.60 ± 0.95 , 1.25 ± 0.25 , 3.35 ± 1.33 and 1.35 ± 0.29 $\mu\text{g/ml}$, respectively. Here the difference in Serum Zn, Fe and Co concentration varied non-significantly among groups ($P < 0.05$). However, Cu concentration varied significantly among groups ($P < 0.05$).

Keywords: Camel, mastitis, milk, mineral anti-oxidant, somatic cell



Superovulatory response and embryo recovery after treatment with different gonadotrophins during Induced luteal Phase in *Camelus dromedarius*

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Abstract

Superovulation embryo recovery and transfer were attempted in 19 dromedary camels of about 6-10 years of age, and having calved at least once. Superovulation was done using two commercially available porcine FSH preparation, FSH-I (11 donors) and FSH-2 (8 donor) during a luteal phase created by inducing ovulation with hCG. The superovulatory response was assessed by ultrasonography. The embryo recovery was attempted non-surgically in sitting position on day 8 and day 7 after first mating in one FSH-1 and one FSH-2 group, respectively. Considerable individual variation in response to the superovulatory stimulus was observed. No Significant difference was observed between the two group in terms of superovulatory response and embryo recovery ($p>0.05$). In total 30 embryos were recovered from 17 donors (1.51 embryos/donor). Recipients were synchronized with donors using hCG. Eight embryos were transferred, resulting in two pregnancies and live births.

Keywords: *Camelus dromedarius*, embryo, embryo transfer, superovulation



Use of real-time ultrasonography for control of follicular activity and pregnancy diagnosis in the one humped camel (*Camelus dromedarius*) during the non-breeding season

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Abstract

Ovaries of 16 adult pleuriparous, non-pregnant and non-lactating one humped female camels (*Camelus dromedarius*) belonging to National Research Centre on Camel at Bikaner, India, were examined for the presence of follicular activity (≤ 0.5 cm diameter) using real-time ultrasonography during June - August, which is considered to be non-breeding season in India. Follicles ≥ 1.0 cm diameter were found in eight females. These animals were mated with virile studs. In four out of eight camels pregnancy was confirmed by progesterone assay and ultrasonography. The study shows that pre-ovulatory follicle may develop in some female camels during June-August (non-breeding season in India) and successful pregnancies may be achieved after mating of individual animals during this period.

Keywords: Ultrasound, ovary, follicle, non-seasonal breeding, *Camelus dromedarius*



Restriction endonuclease analysis of genomic DNA of isolates of *Trypanosoma*

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Abstract

The present study was initiated to focus on the differences or similarities among different isolates of *Trypanosoma evansi* through restriction endonuclease profile. The genomic DNA of *T. evansi*, isolated from naturally infected buffalo, horse and camel were analysed. A panel of restriction enzymes-Alu I, Dra I, EcoR I, Hind III, Kpn I, Not I, Pst I, Sal I, Sma I and Taq I were used for complete digestion of genomic DNA. The agarose gel electrophoresis of digested DNA samples appeared as continuous smear along the electrophoretic tracks on ethidium bromide staining revealing the complete size of trypanosome genome. There was no fixed restriction site, but in restriction enzyme Dra I and Alu I where restriction site at the region of 1.5 kb and 100 bp, respectively, appeared with background smear of DNA fragments. No heterogeneity in the nuclear DNA restriction endonuclease profile among the isolates was recorded.

Key words: DNA/genome, Restriction analysis, *Trypanosoma evansi*



Effect of raw camel milk in type 1 diabetic patients: 1 year randomized study

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Abstract

The efficacy of camel milk consumption as an adjunct to routine diabetic management in maintaining long-term glycaemic control in type 1 diabetes was assessed during a 52 week randomised study. Throughout the duration of the study, 12 randomly assigned patients underwent routine diabetic management (diet, exercise and parenteral insulin supplementation) and 12 randomly assigned patients additionally undertook daily consumption of raw camel milk (500 ml/ day). In both groups, the dose of parenteral insulin administration was adjusted to maintain an euglycaemic state. Glycosylated haemoglobin (Hb A_{1c}) and body mass index (BMI) were measured at the initiation of the study and monitored at 3 monthly intervals. Additionally, plasma insulin, C- peptide and anti-insulin antibodies were measured at the beginning and end of the study. In the group receiving camel milk, there was a significant increase in BMI (17 ± 4.4 to 19.7 ± 2.97 ; $P < 0.001$) and a significant reduction in HbA_{1c} (7.8 ± 1.38 to 6 ± 0.96 ; $P < 0.001$), mean blood glucose (119 ± 19 to 95.42 ± 15.70 ; $P < 0.001$) and necessary insulin dose (32 ± 12 to 17.83 ± 12.40 ; $p < 0.005$) compared to the values at the initiation of the study. There was no significant change in c-peptide (0.18 ± 0.04 to 0.24 ± 0.07) or anti-insulin antibodies (22.92 ± 5.45 to 21.84 ± 7.34). We have demonstrated that the consumption of camel milk in type 1 diabetes results in a significant reduction in the dose of insulin required to maintain long-term glycaemic control. Based on our results, camel milk consumption, may therefore, be considered as a useful adjunct to parenteral insulin administration in the management of type 1 diabetes.

Key words: Camel milk, glycaemic control, insulin, type 1 diabetic patients



Hypoglycemic Activity of camel milk in chemically pancreatectomized rats - an experimental study

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Abstract

In our earlier study, we demonstrated hypoglycemic activity of camel milk in diabetic rats. In continuation of that study, a further study was planned to know whether raw camel milk, pasteurized camel milk and lactoferrin added camel milk have similar response or different response in chemically pancreatectomized rats. 32 Male albino rats were rendered diabetic by a single intra peritoneal injection of streptozotocin 50mg/kg body weigh. Streptozotocin induced diabetic rats were randomized to receive either raw camel milk, pasteurized camel milk, raw camel milk + lactoferrin, or cattle milk and control [non diabetic rats (n=8)] which were followed for 4 weeks. Blood glucose levels of these rats were estimated at weekly interval for four consecutive weeks. Statistical significance was tested by ANOVA with post hoc comparison between group means.

Initial mean blood glucose levels of different groups i.e. Gp.I, Gp.II, Gp.III, Gp.IV and Gp.V were 169.68±28.73, 135.44±20.91, 175.04±35.98, 168.38± 18.67 and 85.94±9.37 mg/dl, respectively. After four weeks of trial, mean blood glucose levels of these groups were 81.54±11.43, 113±29.09, 93.24±11.56, 203.79±40.66 and 77.28±7.41 mg/dl, respectively. There was significant difference with raw camel milk (mean difference 88.14± 17.3, p<0.02), this difference is decreased after pasteurization (mean difference 22.4±8.18, p 0.5) and there was no added advantage after adding lactoferrin (mean difference 81.8±24.42, p<0.05).

The present study indicates that there was significant decrease in mean blood sugar level in diabetic rats getting raw camel milk. There were no added advantages of adding lactoferrin in raw camel milk. Hypoglycemic activity of camel milk decreases after pasteurization. Camel milk may be a therapeutic adjunctive option for diabetes mellitus in humans.

Keywords: Camel milk, pasteurization, lactoferrin, experimental diabetes, streptozotocin rats.



Effect of different management conditions on rutting behavior of Indian dromedary camel

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Abstract

Ten adult male camels of 8-10 year aged were divided into two comparable groups. Group I was given regular exposure to adult female camel for 20 to 30 minutes daily in the morning hours, whereas group II was denied such kind of exposure. Environmental variables, rutting behavioral frequency and intensity parameters, important physical parameters, cardinal physiological responses and plasma hormone levels were studied in non-rutting (Nov- Dec) and rutting (December-February) seasons. The statistically analyzed experimental observation revealed that peak winter season started after 4th and 5th weeks and RH during morning hours was significantly higher than evening, whereas THI was significantly higher during evening hrs than during morning. Rutting behavioral frequency of extrusion of soft palate, flapping of tail and frequency of micturition and spreading urine on it's back were significantly increased in group I as compared to group II after 3rd week. Behavioral intensity of frothing of salivary secretion, making metallic and gurgling sound, back leg separate apart, flow of poll secretion and marking territory were very low during first two weeks, however, during 9th, 10th weeks the intensities were very prominent. In fact the significant variation between groups was found during 3rd and 4th week onwards. In both the groups, frequency and intensity parameters were significantly higher during morning hrs as compared to evening hrs. The cardinal physiological responses like, respiration rate and pulse rate were significantly increased during evening hrs as compared to morning hrs in both the groups. The plasma testosterone and cortisol levels greatly varied among studs in both, the exposed and the unexposed groups. During first two weeks, variations in plasma testosterone and cortisol levels between the two groups were non-significant. But testosterone and cortisol level significantly increased in group I as compared to group II from 4th week onwards and continued till 10th week. Third week onwards DMI (fodder) and body weight got significantly reduced in group I as compared to group II. In both the groups, all rutting behavioral frequency and intensity parameters were negatively correlated with DMI (fodder), water intake, body weight and environmental variables. It is concluded that early rut in adult mature male camel can be aroused by giving regular exposure for 20-30 min to adult female camels, at least for two weeks during the onset of winter season.

Key words: Camel, management, rut, behavior, testosterone, cortisol



Problems of artificial insemination in dromedarius camel - failure of ovulation and entrapment of spermatozoa in gelatinous camel semen

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Abstract

An artificial insemination study was conducted on 17 female camels which were administered human Chorionic Gonadotrophin (hCG) to induce ovulation after confirming a follicle in the ovaries using sonography. The animals were inseminated with either diluted-cooled or fresh undiluted semen. No female camel could be impregnated with diluted and cooled semen, while pregnancy rate was low with neat undiluted semen. To ascertain possible causes of low conception rate, plasma progesterone (P_4) profiles were monitored. Criteria adopted for interpretation of these profiles were as follows: P_4 levels below 1 ng/ml on days 5-8 was considered to indicate failure to ovulate; a single peak of 1 ng/ml on days 5-8 followed by a decline on day 12 was considered to indicate ovulation. However, failure of fertilization and P_4 levels of more than 1 ng/ml on days 5-8 and day 12 followed by a decline was considered to indicate successful ovulation and fertilization, but failure of embryo survival. Consistently higher levels of P_4 were considered to be indicative of pregnancy. Using these criteria, 5 of 33 inseminations were diagnosed as pregnant, while profiles of 17 of 33, 8 of 33 and 3 of 33 were indicative of failure of ovulation, failure of fertilization and failure of embryo survival, respectively. A high incidence of failure of ovulation may be due to oversized follicles or follicles in which degenerative processes might have been initiated prior to administration of hCG. High failure of fertilization may be due to a viscous form of camel semen, which may play a role as a sperm reservoir and protect the viability of spermatozoa in the female genital tract by entrapping sperm. Insemination with diluted and cooled semen may disturb the protection, resulting in failure of conception. It is concluded that the high incidence of ovulation failure and failure to deposit sperm in its natural entrapped viscous form are the major problems for development of AI in the camel. Further improvement may be expected, if we are able to standardize the appropriate insemination time around peri ovulatory time, and appropriate follicular size, which responds to hCG.

Key words: *Camelus dromedarius*, artificial insemination, ovulation



Is low efficiency under AI in camel due to ovulation problems?

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Abstract

The study was conducted on 10 breedable female camels of 6 to 10 years of age bearing mature sized follicles in their ovaries as revealed by sonographic examinations (Pie-scanner-200 using transvaginal transducer of 7.5 MHz capacity). Exogenous hormone (Profassi, 5000 i. u., Serono, Italy) was administered to induce ovulation followed by artificial insemination. The objectives of the study were to evaluate efficiency of hCG to induce ovulation and to impregnate female camels with artificial insemination (AI). Peripheral plasma progesterone analysis either daily or on alternate days from day 0 to 30 was used to assess ovulation and pregnancy status. Behavioural and clinical examinations were also regularly performed for pregnancy. Blood samples for analysis of peripheral plasma progesterone were regularly harvested and quantified by RIA kits. Counting of radioactive disintegration was accomplished in automated gamma-counter PC-RIA MAS 06. None of the 10 inseminated female camels conceived with 0.5 to 1.0 ml of freshly collected camel semen deposited into the uterus. Nine out of 10 female camels exhibited a significant rise in P_4 ($> 1\text{ng/ml}$) at varying stages after hCG administration barring one. The first rise in P_4 concentration above 1ng/ml after hCG administration was recorded on days 3, 4, 6, 8, 9 and 10 in 1, 3, 2, 1, 1 and 1 of the 9 responding females, respectively. P_4 concentration above 1ng/ml persisted for 2-3 days in 5/9 females and 5-7 days in 4/9 females. The magnitude of rise in P_4 concentration was greater in later as compared to former group. The P_4 profiles of later group of animals indicated that these animals have definitely ovulated and developed a normal corpus luteum, while P_4 profiles of another 5 females are difficult to interpret in terms of ovulation and corpus luteum formation. Either these animals have undergone follicular leutinisation without ovulation or else ovulated and developed a weak corpus luteum with short life span. It is concluded that 40% of hCG treated and inseminated female camels have definitely ovulated and developed a normal corpus luteum. More work is required to assess the failure of conception in these females, which apparently may be due to low dose of inseminated semen. It is difficult to interpret the induction of ovulation in another 5 females because of relatively low magnitude and duration of progesterone rise.

Keywords: AI, hCG, ovulation, Progesterone, RIA



Testosterone profiles in the camel (*C. Dromedarius*) during the rutting season

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Abstract

The present study was conducted on 10 adult mule camels over a period of 2 consecutive years to characterize peripheral plasma testosterone profiles in relation to rutting activity. Blood plasma testosterone profiles were monitored during pre-rut, rut and post-rut stages at weekly intervals by RIA. Testosterone concentration in peripheral plasma is low during the pre-rut period (342.93 ± 43.90 ng/ml). Onset of rut activity is associated with significant rise in testosterone concentration (4213.94 ± 278 ng/dl), which is maintained for 11-18 weeks followed by decline to basal levels. The onset of rise as well as decline varied individually. It is also not uncommon to observe complete absence of endocrine surge and rut behavior in some (1/5 in present study) males throughout breeding season. Genetic, nutritional, management, environmental or other possible reasons for this remains to be explored. It is not uncommon for certain young males to exhibit complete shyness when attempted for semen collection despite high testosterone concentration and other external sexual behavior symptoms, which apparently may be due to lack of exposure. The libido and production of semen into AV is maintained for 3-5 months followed by cessation, which also varied individually. Libido subsides in some males in March, in few more in April. Some males continue to have good libido by the end of May. After May majority of the males lose libido and are rendered unable to copulate in A V. Cessation of libido and ability to copulate appears to be associated with decline in testosterone concentration. Cessation of libido appears to be due to erectile impotence. The critical level of testosterone required for erectile potency needs to be worked out. This work shows the correlation between hormone profiles and ambient temperature.

Key words: Testosterone, semen, rut, draft dromedary.



Use of herbal formulation in the cure of Sarcopticosis in dromedary camel

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Abstract

In view of changing scenario of modern therapeutic system to associate herbal based medicine in the various ailments of animals to utilize richly available natural resources effectively, to limit dependency on synthetic drugs/chemicals and to minimize hazardous effects if any occurring otherwise on various system of the body, a herbal formulation developed and therapeutically evaluated at the centre, was tried on dromedary camel in the field against one of the dreadly disease, Sarcopticosis. The findings related to therapeutic response were quite encouraging with a promising future.



Productivity of lactating camels on complete feed blocks

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Abstract

A study was conducted to assess the effect of feeding complete feed blocks (CFB) on lactating camels (8; 516.0 ± 20.9 kg BW in 2nd or 3rd lactation). The animals were offered either dry moth (*Phaseolus aconitifolius*) fodder (MF) or complete feed blocks. The DM intake was higher ($P < 0.05$) in CFB group than those fed MF. DCP and ME intake were higher ($P < 0.05$) by 102.7 and 71.7% in CFB fed than in MF fed camels. The digestibility of nutrients was higher ($P < 0.05$) in CFB than in MF group. Significant higher absorption of Na lower absorption of Ca and P from the gastro-intestinal tract was recorded in CFB as compared to MF fed camels. Except serum albumin, potassium, chloride and phosphorus all other serum biochemicals were higher ($P < 0.05$) in CFB group camels indicating lactating camels given only MF were under nutritional stress. Milk yield was higher ($P < 0.05$) in CFB camels as compared to camels fed MF. The milk total solids, protein and lactose were higher ($P < 0.01$) in CFB than in MF. The average daily gain was higher ($P < 0.01$) in CFB than that in MF group. In spite of higher cost of complete feed block, the profit was observed to more in CFB than in MF group it was inferred that feeding of complete feed blocks improved nutrient utilization, milk yield of lactating camels and it was economical as well.

Keywords: Moth fodder, complete feed block, nutrient utilization, milk yield, camels.



Nutrient utilization of gram straw (*Cicer arietinum*) based complete feed blocks in camel calves

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Abstract

In the first phase nutritional evaluation of gram straw (GS) as sole roughage diet in 4 camel calves (10-12 months, 240-276 kg) was studied for 21 days. In second phase, 12 camel calves (approximately 10 months; 187-240 kg) were randomly distributed into 3 groups of 4 each and were given complete ration in loose form (CR1-L) consisting of gram straw chaffed dry groundnut forage and concentrate in the ratio of 70: 15: 15, complete ration having similar composition as the of CR1-L but in the form of feed blocks (CR 1-FB) and complete ration consisting of gram straw, groundnut forage and concentrate in the ratio of 60: 25: 15 in feed block form (CR2-FB) for 98 days. Significant ($P<0.05$) difference was observed for all proximate principles except CF and cell wall components among GS and CR 1-L, CR 1-FB, CR2-FB. Nutrient intake of DCP, TDN and ME did not differ significantly among CR 1-L, CR 1-FB and CR2-FB but was significantly higher than GS. Nutrient intake in terms of DCP g/kg $W^{0.75}$ was significantly highest (7.77) in CR2-FB and lowest (4.01) in GS while TDN was significantly highest (62.40) in CR 1-L and lowest in GS (41.41). The apparent absorption (%) of Na, Ca and P differed nonsignificantly among the groups given complete rations but was significantly higher as compared to GS. The average daily gain and feed/body weight gain ratio did not differ significantly among CR 1-L, CR 1-FB and CR2-FB and ranged from 377.55 to 420.92 g/d and 13.51 to 14.30 respectively. It was inferred that camel calves given complete feed blocks had better nutrient utilization and growth, apart from additional advantages of easy handling, storage and transport of complete feed blocks.

Key words: Animal nutrition, camel calves, complete feed block, gram straw, groundnut forage, mineral absorption, nutrient utilization



Evaluation of complete feed blocks in draft camels in arid ecosystem

A.K. Nagpal, A. Jabbar, G.P. Singh and M.S. Sahani

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Abstract

Draft camels (5;11.6±1.4 yr old of 634±37.8 kg BW) engaged in water supply were selected and the study was conducted in 2 phases for 41 days. In phase I, the draft camels were given sole chaffed guar (*Cymopsis teragonoloba*) straw or dry chaffed moth (*Phaseolus aconitifolius*) fodder and in phase II, the camels were fed complete feed blocks consisting of guar straw, groundnut (*Arachis hypogea*) haulms and concentrate mixture in the ratio of 70.3: 15: 14.7. The nutrients intake was higher ($P<0.0.1$) in draft camels given complete feed blocks in phase II as compared to that in phase I. The digestibility of CP was higher and that of CF was low ($P<0.05$) in phase II as compared to that in phase I. The draft camels in phase II worked daily for 17.93% longer time, made 19.72% more rounds of water tanks, covered 13.56% more distance and consumed 23.81 % more feed. In spite of higher feed and water purchase cost in phase II (Rs 172.05), the net income was 10.99% higher in phase II (Rs 126.33) than in phase I (Rs 113.82). It was inferred that feeding of complete feed blocks resulted in higher economic returns, and was beneficial for the health and life of draft camels.

Keywords: complete feed block, nutrient intake, draft camels, economics



Hypoglycemic activity of camel milk in streptozotocin induced hyperglycemia in rats

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²Department of Medicine S.P. Medical Collage, Bikaner 334001

Abstract

A controlled study of the oral hypoglycemic activity of camel milk was investigated in rats. The 3-week trial study revealed that rats getting raw camel milk showed a significant decrease in mean blood sugar level compared to rats getting raw cattle milk.



Comparative therapeutic evaluation of oral electrolyte solutions in calf diarrhea

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Abstract

Oral electrolyte solution (OES-ME, OES-HE, OES-G) were evaluated for the management of diarrhea in calves. The haemato-biochemical profile of OES-G was similar to that of OES-EF but later showed better recovery. OES-HE showed the best clinical and haemato-biochemical improvement.

Key words: Calf, diarrhea, glutamine, oral electrolyte solutions, therapy



Methane production in relation to productivity of livestock and environment: A review

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Abstract

Fermentation of feed in rumen of animal results in production of volatile fatty acids (acetate, propionate and butyrate), and microbial protein is synthesized from protein and non-protein nitrogen. Volatile fatty acids are the source of energy, and protein synthesised is used as source of protein by the host animals. In addition VFA and microbial protein, methane is produced. Feed energy is lost to the tune 5-15% of gross energy. However, feed energy loss in methane is reduced by increasing the concentrate in diet, balance diet, feeding of green fodder, supplementation of deficient nutrient including urea-molasses minerals, supplementation of feed additives etc. Secondly methane emission reported by outside workers was higher to estimates of Indian workers. Proper feeding of livestock will increase the productivity and protect the environment in terms of global warming.

Key words: Environment, livestock, methane production, productivity



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Calving pattern and neonatal behaviour in Indian dromedary camel

C. Bhakat

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Abstract

In 19 healthy camels detailed observation on signs of labour, calving and neonatal behaviour were made and various parameters were quantified and presented.



Camel: A unique species in hot arid desert ecosystem

C. Bhakat and M.S. Sahani

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Abstract

Camel can tolerate high temperature, solar radiation and water deprivation and subsists on poor quality, thorny, vegetation. Camel hair is having great economic importance for its better utility as pure camel hair blends with other fibers in rural cottage industry. Camel milk has comparatively better keeping quality and medicinal properties. Camel hide and bone can also be used for making various types of consumer goods including fancy decorative item. Camel dung is a good organic manure and fuel. Draught use of camel carting is profitable and advantageous over bullock carting for small farmers. Camel is also gainfully utilised riding, racing, ploughing for livestock. Camel's meat, marketing camel as draft and game animal are of economic importance.



Superovulation response to a Progestagen ear implant PMSG and HCG treatment in female camels

A. Deen and M.S. Sahani

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Abstract

A group of 8 female camels was given superovulation treatment with a Crestar ear implant*, Folligon** and Professi***. A single Crestar injection of 2ml was given intramuscularly (i/m) along with a Crestar ear implant, which was kept in situ for 7 days, and then removed. An i/m injection of Folligon (2000-4000 i.u) was given at the time of removal of the implant. The animals were monitored for follicular growth in their ovaries and were bred at appropriate times. An i/m injection of Professi (5000 i.u. hCG) was given at breeding time. Recto-genital palpation and endocrine profiles of progesterone (P₄) were regularly monitored at appropriate intervals to assess the ovulation response and follicular growth respectively. P₄ profiles indicated that 4/8 (50%) females did not ovulate in response to superovulation treatment Recto-genital palpation indicated that the ovulation response was unremarkable in the other 4 animals. This varied from 1 CL to 3-5 CLs. Thick-walled, bilateral cysts were observed in one female while another had a unilateral, thin-walled cyst that ruptured during ovarian palpation. Embryos could not be recovered from these females by non-surgical uterine flushing. Loss of fluid into the vagina during flushing of the uterus is problematic in this species. This could be due to improper fixation of the catheter bulb in the uterine horn or it is pushed back under the pressure of infused fluid in the act of retraction of the uterine horns during flushing. It is concluded that embryos could not be recovered due to a poor superovulation response, while the loss of fluid into the vagina is also problematical. This needs to be resolved for the development of a multiple ovulation and embryo transfer programme.

Key words: Superovulation, PMSG, hCG, Progestagen



Cryopreservation of camel semen

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Abstract

The study was conducted on cryopreservation of 70 semen samples artificially collected from 11 adult male camels of Jaisalmeri breed (Dromedary) of this centre. The semen samples were diluted at the rate of 1: 3 with Tris Egg Yolk glycerol extender, cooled in a refrigeratory unit and evaluated for progressive sperm motility in Inverted Phase Contrast Microscope (Nikon, 400 X magnifications) with attached video monitor 4-6 hr after collection of semen. Those semen samples, which exhibited good sperm motility were transferred to cryo-vials, each sample in duplicate, labelled and frozen in automated liquid nitrogen based cryo-freezer (Planner KRYO 10-1.3), where the vials were cooled to -100 ° C followed by their immersion in liquid nitrogen container. Pre-freeze motility varied from 47 to 70% in different males. Post-thaw motility declined from 23.5 to 47.5% in individual semen samples with an overall estimated loss of 62.5% of the progressively motile spermatozoa due to freeze thaw process. Based on criteria adopted by several workers in camel AI, to approve semen of 30% or greater post-thaw motility, only 37% of semen samples processed in present study qualified for approval to be of use for AI. The rejection rate of more than 50% was greater than those of dairy bulls of 5-15%. Post thaw motility of same semen sample cryopreserved in duplicate vials in same batch differ significantly. Post-thaw duration of survival of thawed spermatozoa was studied by incubating at 37 and 4°C. At 37°C, the reduction in motility was about 50% than at 0 hr. At 2, 3, 4 and 24 hr after incubation, almost 93, 99 and 100 % spermatozoa lost motility. At 4°C incubation, the per cent decline was 17, 30, 35.8, 44.1 and 65.5%, at 1, 2, 3, 4 and 24 hr of incubation.

Keywords: Camel, cropyreservation, semen



Frequency rescheduling of a herbal formulation against sarcopticosis in dromedary camel

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Abstract

In continuation of development of herbal drug formulations against Sarcopticosis in dromedary camel, one of the two so far developed formulations. F 1 was rescheduled on naturally occurring clinical cases. A number of total 5-7 applications were found to be sufficient in curing the disease. Results were comparable of daily and alternate applications followed by 5th day. A combination of both initially daily for three days and then of remaining ones on alternate days would be a better approach to manage the disease successfully.



Use of Neem (*Azadirachta Indica*) and Tobacco (*Nicotiana Tobaccum*) as an ectoparasiticide against mange in camels

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Abstract

In order to evaluate therapeutic efficacy of plant based medicine in the treatment of one of the most commonly occurring disease Sarcopticosis in camels, different parts of the two plants (Neem and Tobacco) were put in to trial in different forms (Extract, Paste). During the process of making the drug for evaluation, the efforts were made not to adopt any such modern technique which can increase dependency on high tech driven instrument and change their natural instinct and therefore procedure adopted to make the drug in applicable form was very simple and does not require any sophisticated instrument. The local application of the drug on preliminary studies could not prove to be much encouraging as markers fixed for analysis (skin coat condition, scrapings examination) failed to yield appreciable results.

Keywords: Neem, tobacco, camel, mange



Physical properties of a herbal formulation and its ingredients at room temperature

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Abstract

In an attempt to study the physiological properties of prepared herbal formulation under our traditional system, the different ingredients individually and collectively were evaluated for their unaltered characteristics. Formulations are assessed to be of value for nearly 20-25 days at room temperature with out support of any preservative/mechanical device, appear to be appropriate for rural masses.



Milk production potential and keeping quality of camel milk

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Abstract

Daily milk production in 5 lactating camels each of Bikaneri, Jaisalmeri and Kachchhi breeds belonging to first, second and third parity was studied. Milk yield was recorded daily at 12h intervals by 2 different milking techniques, viz. 4-teat stripping and 2-teat stripping of one side and allowing the calf to suckle the other 2-teats. The average daily milk production by 4-teat and 2-teat stripping were 2.80 ± 0.17 and 3.98 ± 0.32 l/day in Bikaneri, 2.60 ± 0.17 and 3.90 ± 0.34 l/day in Jaisalmeri and 3.04 ± 0.17 and 4.12 ± 0.35 l/day in Kachchhi, respectively. The effect of breed was significant ($p < 0.05$) for total milk production in 4-teat stripping. The effect of parity was also significant ($P < 0.01$) for total production under both the milking techniques. The month-wise daily milk production under both the techniques indicated significant ($p < 0.01$) variation. Keeping quality was studied in 50 fresh camel milk samples comprising of pure and milk diluted with water (1 :1) kept at room temperature ($29 \pm 3^\circ\text{C}$); pure and diluted (1:1) milk stored at 4°C . The parameters studied at 2 h intervals were acidity, clot on boiling (COB) test, alcohol test, alizarin-alcohol test and pH. The study indicated that pure and diluted (1:1) milk at room temperature could be stored for 8 and 10 h, respectively, while pure and diluted (1:1) milk at 4°C can be stored for 20 and 28 days, respectively.

Keywords: Camels, keeping quality, milk production potential



Haemato- biochemical changes in camels infested with mange during winter and summer season

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Abstract

The present work was aimed to study the haemato-biochemical alteration in mange infested camels in comparison to the normal healthy camels during winter and summer seasons. There was significant ($P < 0.01$) decrease in haemoglobin (Hb) and neutrophils, while a significant increase in eosinophils, lymphocytes, aspartate aminotransaminase (AST), alanine aminotransaminase (ALT), triglycerides, urea and glucose were seen in mange infected camels during winter season. During summer season decrease in albumin content and an increase in total leucocyte counts (TLC), eosinophils, monocytes, AST, ALT, triglycerides, urea was observed. This study indicated that winter is most conducive for spread of mange infection and treatment during this period should be supplemented with supportive therapy along with acaricides.

Keyword: Acaricide, Camels, haemato- biochemical, mange, season



Therapeutic value of camel milk as a nutritional supplement for multiple drug resistant (MDR) tuberculosis patients

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Abstract

A cohort of 14 male in-patients who suffered from tuberculosis for the past 7-8 years and who did not receive regular treatment were divided into two groups, T1 and T0 of 8 and 6 patients, respectively. T1 patients were given a diet supplemented with raw camel milk at 1 kg/day, while T0 patients were given dairy milk through 10 weeks. Both groups received an almost similar treatment with regular meals from the TB hospital. The clinical symptoms, bacteriological, radiological haematobiochemical, immunoglobulins, Mantoux test and body weight were recorded before and at the completion of the experiment. At the end of the experiment there was no cough, expectoration, breathlessness and chest pain in the T1 group. Furthermore, the acid fast bacillus (AFB) status was found to be negative in T1 group, whereas it remained positive in the T0 group. Mantoux test was negative in T1 group at the end of the trial. Reduction in the radiological reflections was more pronounced in T1 group as seen by X-ray. Haematological findings revealed significantly ($P<0.01$) higher hemoglobin (Hb), reduction in erythrocyte sedimentation rate (ESR) and total leucocyte count (TLC) among the camel milk supplemented patients. An increase in appetite and body weight was seen in the patients supplemented with camel milk. The activity of lactate dehydrogenase (LDH) and creatine phosphokinase (CPK) was significantly ($P<0.01$) reduced in T1 group. A significant ($P<0.01$) increase in micro-mineral contents of zinc (Zn) and iron (Fe) was found in the T1 group. Percent decrease in IgA and IgG was 45.18 and 65.25 respectively in T1 group, while it was 34.98 and 41.55 in T0 group. These results suggest that there was a positive benefit of camel milk supplementation in TB patients.

Key words: camel milk, nutritional supplement, multiple drug resistant, tuberculosis.



Genetic differentiation of Indian camels (*Camelus dromedarius*) breeds using random oligonucleotide primers

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Abstract

The camel population in India is facing a severe decline which demands that immediate steps are taken to ensure its conservation. Characterisation is an integral part of the conservation program. The Polymerase Chain Reaction-Randomly Amplified Polymorphic DNA profile of unrelated camels of the Bikaneri (29), Jaisalmeri (30) and Kachchhi (18) breeds were analyzed. Reproducible polymorphic bands with varying frequencies among the three breeds of camel were obtained with five oligonucleotide primers. A total of 75 bands were amplified, of which 27 (36%) were polymorphic. The probability of obtaining identical fingerprints was observed to be the lowest in primer GC-10 (5.7%) followed by OP-08 (8.7%), GT-10 (11.3%), G-2 (15.5%) and G-1 (80%). Breed informative bands were amplified. The maximum genetic variability was observed in the Bikaneri (0.80 ± 0.05) followed by the Kachchhi (0.84 ± 0.06) and the Jaisalmeri (0.87 ± 0.05) breeds. The inter-breed genetic distance estimates indicated a closer relationship in the Bikaneri-Kachchhi camels, (0.075), followed by the Jaisalmeri-Kachchhi (0.106) and Bikaneri-Jaisalmeri (0.132) breeds. A similar genetic relationship was observed when the degree of population subdivision was measured between the Bikaneri-Kachchhi (0.529), Jaisalmeri Kachchhi (0.558) and Bikaneri-Jaisalmeri (0.566) breeds.



Effect of weaning on growth performance of camel calves

N. Saini and G. P. Singh

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Abstract

Fourteen camel calves of Bikaneri, Jaisalmeri and Kachchhi breeds at 3 months of age were divided into two similar groups. Calves of group I (126.70 kg BW) were weaned and maintained on concentrate mixture and available fodder viz., guar (*Cyamopsis tetragonloba*) phalgati, moth (*Vigna aconitifolia*) chara and groundnut (*Arachis hypogaea*) chara, while calves of group II (139.40 kg BW) were kept with their dams to suckle milk and grazing. Average daily weight gain over 137 days was significantly ($P < 0.01$) higher in group I (535.03 g/d) than that of group II (491.24 g/d). Dry matter intake in weaned calves increased with increase in body weight and it varied from 1.66 - 2.25 kg/100 kg body weight with an average of 1.92%. For better growth performance and feed conversion efficiency camel calves can be weaned at 3 month of age.

Keywords: Weaning, utilization, cost, feeding



Camel rearing practices – A survey study in arid western agro ecosystem of Rajasthan

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Abstract

Camel rearing in northwestern arid region of Rajasthan was studied in 8 districts, these fall in 5 agro climatic zones of state. Camels are reared based on traditional knowledge by utilising natural available resources and the main utilities are self domestic use, breeding and selling purpose. Mostly camels are managed on rangelands, community land, restricted controlled pasture lands (gochers or orans-vernacular words). Traditional feeding constituting exclusively grazing plus providing some supplementation of leaves during lean period has shifted to grazing plus providing some additional local fodder to meet the dry matter requirement. None of the respondents provide mineral mixture to their camels. Majority of the camel keepers (60%) feed single type of local grown fodder whereas (39.0%) farmers feed mixed dry fodder. Generally green forage is not offered except 23.4% farmers of Hanumangarh and Sriganganagar district and Rajgarh tehsil of Churu, mostly from a green belt, who offer green chana fodder to their camels. Concentrate supplementation once a week is done only to debilitated camels (1 to 2 kg) against scientific recommendation of 2-3 kg/ d. Irrespective of season, camels are generally kept in open housing system. Failure of availability of conventional flora and grazing resources due to frequent drought, shrinking of grazing land owing to fast urbanisation and restriction imposed by the forest department has forced camel breeders to offer some straw in addition to grazing in the rangeland thus, increasing cost of feed input.

Keywords: Camel, disease, feeding, management practices, Rajasthan



Effect of *Panicum antidotale* grass on the performance of camel under semi-intensive condition

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Abstract

To assess the effect of green grammna (*Panicum antidotale*) grass supplementation on the performance of lactating camels. Bikaneri camels (10) of 3rd and 4th parity divided into two equal groups were allowed to graze and browse on rangeland pasture vegetation for 6 hrs daily and fed *ad lib* guar fodder supplemented with or without 3 kg grammna grass (GG)/animal/d. Intake of DM, DCP and digestibility of nutrients were higher in group supplemented with GG than unsupplemented group. The average milk yield (4.98 vs. 4.27 l/d) as well as 305 day lactation yield (1528 vs. 13021) was significantly higher ($P < 0.05$) in group of camels supplemented with GG than unsupplemented group. It was concluded that green grammna grass supplemented to guar fodder improved utilization of nutrient and milk production of lactating camels.

Keyword: Grammna, nutrient utilization, milk production, lactating camels



Role of sulphur in animal health

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Abstract

Minerals play an important role in maintenance of animal health, which most of the farmers ignore. Mineral disorders including deficiencies, toxicities and imbalances are severely inhibiting grazing livestock in developing tropical countries cause great economic loss to farmers due to poor growth, suboptimum production and infertility. It is often difficult to diagnose and may be confused with parasitic infestation and semi-starvation due to underfeeding. Therefore, knowledge about important mineral elements and its role in animal health and for proper functioning of reproduction and production system, no doubt solve the most of the problems of low productivity in animals.



Characteristics of diarrhoea with *Escherichia coli* as the major cause in new born calves having adequate serum immunoglobulin concentration

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Abstract

The present study was undertaken on 80 clinical cases of diarrhoeic calves of either sex, aged under 4 months, from an organized dairy herd. Feeding and management conditions at the farm were found adequate with regular deworming and feeding of colostrum @ 1/10th of body weight starting within 3-4 h of birth until 3 days. All the diarrhoeic calves had normal serum immunoglobulin concentration of > 16 mg/ml. Significantly higher incidence of diarrhoea was noticed in the age groups of 1-2 months (37.50%), followed by 1-15 days (31.25%), 15 days-1 month (16.25%) and 2-4 months (15.00%). Sex and breed of calves did not significantly influence the incidence of diarrhoea. Semisolid to watery faeces, along with significant depression, dehydration and reduced appetite were the notable clinical characteristics of the calves suffering from moderate degree of diarrhoea. The faeces were yellow to green having, in majority of cases, offensive odour while the laboratory examination of faecal samples ruled out parasitic cause for the diarrhoea, the cultural examination of rectal swabs confirmed the presence of enteropathogenic *Escherichia coli* as the causative organism in 68.75% of diarrhoeic calves. *In vitro* drug sensitivity testing of isolated *Escherichia coli* revealed cotrimazine (sulfadiazine+trimethoprim) to be highly effective (4+).

Keywords: Colostrum, diarrhoea, *Escherichia coli*, faeces, Immunoglobulin, new born calves



Studies on passive immune status and protein profile in neonatal camel calves

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Abstract

A total of 6 neonatal camel calves born to the healthy dams were considered in the present study. The passive immune status (Immunoglobulin level) and serum protein profile of all the calves were estimated at zero hour (immediately after birth), 12, 24, 36, 48 and 72 hours at weekly interval till 4th week and fortnightly interval till 3 months. The serum immunoglobulin (Ig) status at zero hours was very low and it increased significantly after 12 hours and later up to 72 hours. The increasing trend was drastic till 72 hours and later slight increase in trend was noticed up to 3 months. The Ig and serum protein profile revealed highly significant changes in the newly born calves till 3 months of age. The mean total protein and globulin concentration showed a highly significant increasing trend up to 3 months. The mean albumin levels and AG ratio showed a decreasing trend till 72 hours and later albumin concentration revealed an increasing trend till 3 months whereas, AG ratio showed almost constant variation in the camel calves.

Keywords: Dromedary camel calves, protein profile, immunoglobulin



Bacteriology of camel drinking water

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Abstract

Rural and urban area of Bikaner city animal drinking water samples were assessed for bacteriological counts as well as isolation and identification of bacteria. On the basis of APHA (1946) standards, all the 37 water samples were found to be of unsatisfactory grade. With their bacterial load per ml of water 10^3 in 10.81 per cent, 10^3 - 10^4 in 43.24 per cent, 10^4 - 10^5 in 40.54 per cent and $>10^5$ in 5.41 per cent of samples, respectively. Various microorganisms identified in order of their frequency were *Escherichia coli* (27.02%), *Salmonella spp.* (13.51 %), *Micrococci* (13.51 %), *Staphylococcus spp.* (10.81%), *Corynebacterium spp.* (10.81%), *Bacillus spp.* (8.10%), *Proteus spp.* (8.10%), *Klebsiella spp.* (5.41%), and *Streptococcus spp.* (2.70%), respectively. Their antimicrobial sensitivity testing using 17 antimicrobials, revealed 100 per cent sensitivity to Ciprofloxacin followed by Chloramphenicol and Gentamicin (94.59%), Cloxacillin (86.49%), Nitrofurantoin (83.78%), Polymyxin-b (81.08%), Tetracycline and Oxytetracycline (78.38%), Neomycin (67.57%), Kanamycin (64.86), Amoxyclav (62.16%), Furazolidone (54.05%), Cephalexin (29.73%), Erythromycin (18.92%), Ampicillin (5.41 %). All the isolates were resistant to Lincomycin and Penicillin-G.



Technical knowledge of camel management practices in the arid Thar desert environment

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Abstract

Information was collected from 294 camel-keepers in the Thar desert to identify the technical details of camel management and to crosscheck data for relevance testing. A total of 156 practices were identified and scientific relevance values obtained for each. Overall, 95, 37 and 24 practices had high, medium and low relevance values, respectively. In the case of trypanosomiasis, impaction, overall feeding and breeding, the variation between traditional and scientific management practices was found to be significant ($P < 0.01$), but for mange, the variation was not significant. Most single camel owners (54.46%) opted for modern veterinary drugs; owners of >5 camels (47.27%) preferred the traditional approach, while owners of 2-5 camels (43.48%) believed in a mixed management system. The number of camels significantly ($P < 0.01$) influenced these management practices. The study concluded that a balanced combination of traditional and scientific practices can cope better with problems of camel management at grass-roots level, and practices having a high and medium scientific relevance value must be preserved before they are lost.



Testosterone profiles and their correlation with sexual libido in male camels

A. Deen

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Abstract

The study was conducted on 4 male Jaisalmeri camels (*Camelus dromedarius*) on their circulating testosterone (T) profiles and correlation with sexual libido. The average T concentration was low during hot months of April to September, started increasing in the months of October and November, continued to increase steadily in the months of December, January and February followed by decline in the ensuing months. Individual variations in onset and cessation of T surge were observed. Sexual libido as indicated by copulation time (CT) and volume of semen ejaculated (V) was high during January to April months, declined slowly over May month followed by complete cessation in later half of June. Sexual libido was almost negligible during July to November months. The sexual libido was also low during December month. Like circulating T profiles, individual variations were also observed in sexual libido. Data indicated that onset as well as cessation of T surge preceded the onset and cessation of sexual libido in all the animals. A positive correlation was found among circulating T (concentration), CT and V of semen. It is concluded that seasonal changes in circulating testosterone governs sexual libido in male camels.

Keywords: Camel, testosterone, copulation, semen



Low ambient temperature with the onset of winter can disturb radio immuno assay due to increased association constant of antibody

A. Deen

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Abstract

In our laboratory, Radio-immune assay (RIA) for quantification of estradiol 17β was standardized using antioestradiol (Prof. Niswender, Colorado State University, USA) and $2,4,6,7,16, 17\text{-}^3\text{H}$ oestradiol (Amersham Biosciences Ltd., U.K.) as tracer. Antibody titer was determined to give maximum binding of 50% with the tracer. This titer was used for assays between July to November 2004, all of which exhibited a perfect displacement of tracer by increasing concentration of calibrators. With the onset of winter, assay procedure was suddenly deteriorated, resulting into no displacement of tracer by calibrators. Buffers, standards and other chemicals were prepared freshly but yielded no improvement in repeat trials, the observations of the results obtained in repeated trials revealed that there were significant displacement of tracer in only 2-3 of highest concentration calibrators out of total 10 calibrators. For remaining 7 calibrators, displacement was not visible, though the binding of tracer was very high. While facing this problem, we come across to an important aspect of antibody-heptanes interaction, that low temperature increases association constant of antibody. Working on this point, the antibody titer was recalibrated for winter atmospheric conditions. It was found to increase by 10 folds. Successful re-standardization was accomplished with altered antibody titer. It was concluded that low ambient temperature might disturb your RIA due to increased association constant (K_a) of antibody.



Estradiol -17 β and progesterone profile female camels at different reproductive stages

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Abstract

The study was conducted on 56 female camels for E2 and P4 profiles at different reproductive stages, viz. 35 bred females (Group A) monitored after breeding once daily for 0-30 days were divided into 2 groups of pregnant (n=13) and nonpregnant (n=22) based on P4 profiles, another pregnant group (Group B) (n=8) was monitored at weekly intervals from 23rd weeks to the end of gestation; periparturient camels (Group C) were monitored at 6h intervals, while nonpregnant females (n=7) (Group D) with growing and mature follicles were monitored for E2 profiles only and the final group (Group E) (n=6) of nonpregnant females was monitored for E2 profiles before and after mating. The average P4 concentrations in pregnant and nonpregnant females of group A were similar from days 0 -10 after mating. They declined from day 11 onward in nonpregnant females, but continued to increase in pregnant animals ($P < 0.01$). The average daily E2 profiles were found to be low or basal in both non-pregnant (1.32 to 8.74 pg/ml) and pregnant females (0.69 to 8.24 pg/ml). The average concentration of P4 in group B was relatively higher (5.87 to 12.07 ng/ml) between 23rd to 32nd weeks of gestation than at later stages (2.88 to 5.09 ng/ml). The average concentration of P4 recorded in periparturient female camels of Group C was around 4.0-4.5 ng/ml at 55-31 hrs prior to parturition and declined slightly to measure 3 ng/ml at parturition. A further decline in P4 concentration to 1.6 ng/ml occurred after expulsion of the fetus. The average concentration of E2 was low up to 38th weeks of gestation. It started to increase slowly and steadily after the 39th week and measured more than 50, 100, 250, 300 and 375 pg/ml at the 42nd, 45th, 47th, 49th and 52nd weeks of gestation, respectively. It declined in periparturient females to 92.2-243 g/ml at 1-55 hrs before calving. It further declined sharply to 23.3, 5.6 and 6.6 pg/ml at 5, 11 and 17 hrs after calving.

E2 profiles of nonpregnant females of group D (n=7) with mature sized ovarian follicles monitored at 30 minute intervals for 2 hrs daily for 15-20 days (for E2 profiles only) revealed mostly basal levels with a few intermittent peaks, indicating the pulsatile nature its secretion. One group of nonpregnant females, Group E (n=6) with mature follicles monitored for E2 profiles only, one day prior to and immediately after mating showed that E2 profiles at these times did not differ.

Keywords: Camel, radioimmunoassay; estradiol, progesterone, Pulsatile



Evaluation of plants /herbs for antimicrobial activity

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Abstract

Cultural studies on camel skin microorganisms led to isolation and characterization of number of bacteria viz. Pseudomonas, Bacilli, Cornybacterium, Klebsiella, Micrococci, Proteus, Pseudomonas, Staphylococci, Streptococci and many other unidentified organisms. *In vitro* sensitivity lest conducted against these isolates using juice/extract from various parts of commonly available desert plants was quite encouraging as evident from the area of zone of inhibition (ZIH) which varied from ++++ to + ZIH. Showing their usefulness in the management of diseases caused by these Isolates alone or in combination.



Evaluation of plants/herbs for immunomodulatory properties

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Abstract

A herbal edible preparation comprising of juice of *Aloe vera* (Gwar patha), *Leucaena alidcorephala* (Babool), *Tinospora cardifolia* (Gilooi) *Lowsonia inermis linn* (Mehendi), *Ocimum basilicum* (Tulsi) and jiggery was prepared and fed orally @ 25 mg/kg body weight SID for 15 days. Levels of serum globulin pre and post (10, 20, 30 days) medication were monitored to ascertain the immunomodulatory property of the formulation. Result were suggestive of not any favourable and satisfactory response on preliminary trial. However, no side effects were noticed.



Changes in chemical and micro-minerals content of dromedary milk during lactation

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Abstract

The present study aims to know the chemical and macro-minerals composition of the camel milk. The chemical composition of camel milk revealed higher pH, protein, casein, fat and total solids in the late phase of lactation, while vitamin-C content was higher in early phase of lactation. The macro-minerals composition revealed higher levels of sodium, potassium, calcium, phosphorus and magnesium in late phase of lactation. The vitamin-C content in camel milk is high, compared to cow's milk. These findings clearly reflect that the milk composition varies with stage of lactation.

Keywords: Camel milk, chemical composition, lactation, macro-minerals



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Milk Composition among different breed of camel

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Abstract

Composition of milk in different breeds of camel is reported. Significant of breeds was observed for protein, casein, fat, pH, total solids and solids-not-fat.



Microsatellite analysis in Jaisalmeri camel (*Camelus dromedarius*)

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Abstract

Microsatellite analysis with sixteen new world camelidae microsatellite markers was carried out to explore the possibility of cross-species amplification in Jaisalmeri camel (*Camelus dromedarius*). Blood samples of fifty unrelated camels of Jaisalmeri breed from the farm as well as field were collected. The microsatellite loci were carried out and were resolved on 6 % denaturing urea PAGE. The DNA bands were stained with silver nitrate and size marked. Out of sixteen microsatellite loci, thirteen were found to be polymorphic in Jaisalmeri camels. The number of alleles ranged from 2 to 7. The expected heterozygosity ranged from 0.320 to 0.816. The polymorphic information content ranged from 0.268 to 0.791. The results indicated positive cross-species amplification of new world camelidae microsatellite markers in Jaisalmeri breed.

Keywords: Jaisalmeri camel, Microsatellite markers, Polymorphism



Microsatellite markers for genetic characterisation of Kachchhi camel

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Abstract

Sixteen microsatellite loci were investigated for studying the genetic polymorphism in Kachchhi breed of camel. Polymerase chain reaction were carried out for 50 unrelated camels of Kachchhi breed. The amplification products were resolved in 6% (denaturing) urea PAGE and stained with silver nitrate. Out of the 16 microsatellite loci 13 were found polymorphic. The number of alleles ranged from 2 to 6. The expected heterozygosity ranged from 0.332 to 0.796. The polymorphic information content ranged from 0.277 to 0.765. The results indicated existence of enough genetic variation among dromedary individuals and the potential use of microsatellite markers for further genetic investigations including genetic diversity analysis, individual identification, parentage testing and production enhancement.

Keywords: breed, camel, genetic characterisation, Kachchhi, microsatellite



Microsatellite markers for genetic characterization of Bikaneri camel

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Abstract

Microsatellite loci (16) were investigated for studying the genetic polymorphism in Bikaneri camels. Out of them 13 loci were found polymorphic. The number of alleles ranged from 2 to 7. The expected heterozygosity ranged from 0.289 to 0.815. The polymorphic information content ranged from 0.267 to 0.789. The results indicated existence of enough genetic variation among dromedary individuals and the potential use of microsatellite markers for further genetic diversity analyses and production enhancement.

Keywords: Breeds, camel, characterisation, microsatellite.



Status and conservation of Mewari and Jaisalmeri camels in India

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Abstract

The Mewari and Jaisalmeri breeds of camel are among the four major breeds of Indian camel. The Mewari breed is known for the production of milk and its adaptability to the hilly terrain of the Aravali hills in south Rajasthan whereas the Jaisalmeri breed is known for its riding and race potential. A total of 320 camels from 16 herds in eight villages belonging to three districts of the major breeding tract of the Mewari camel were covered. The population of the Mewari camel was estimated to be 16221 heads with a 28% decline in the last five years. The extent of cross breeding was estimated to be 36%. The average adult Mewari camel had a 193 cm height at wither 194 cm heart girth and 158 cm body length. Adult Mewari camels produce about 700 grams of hair per annum and the females produce 5-7 litres of milk per day. An integrated rotational grazing pasture development programme could be of great use in maintaining the Mewari camels with diverse livestock species under optimum production.

To define the status of the Jaisalmeri camel, an investigation encompassing 1760 camel breeders belonging to the 181 villages distributed over the entire strata of the tract was carried out. The population of the Jaisalmeri camel was estimated to be 118083 heads with a 31 % decline in the last five years. An adult Jaisalmeri camel had a 199 cm height at wither 211 cm heart girth and 156 cm body length. Adult males and females weighed 593 and 519 kg, respectively. Emphasis should be placed on making the breedable males of the breed available throughout the strata and on improving the utility of the breed for in-situ maintenance of genetic diversity in the breed.

Keywords: Camel, Mewari, Jaisalmeri, Mewati, Characterization, conservation.



Nutrient utilization and performance of pregnant camels kept on different levels of protein

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Abstract

Twelve pregnant camels (9-12 years; 564.67 ± 13.47 kg) in their 2-3 parity were randomly distributed into 3 groups and were kept on diet consisting of guar straw, groundnut haulms and concentrate mixture to provide 9.5% CP (Gp1), 10.5% CP (Gp2) and 12% CP (Gp3) keeping same 50% TDN level. The DM intake kg/100 kg body weight was 1.53 in Gp1, 1.61 in Gp2 and 1.65 in Gp3. Except EE, the digestibility of all proximate components was similar, being highest in Gp3 where high dietary CP was fed. The daily intake of DM, CP and TDN, respectively were 10.01 ± 0.18 kg, 948.80 ± 18.92 g and 4.945 ± 0.13 kg in Gp1; 10.36 ± 0.39 kg, 1094.63 ± 38.12 g and 5.238 ± 0.27 kg in Gp2 and 10.74 ± 0.64 kg, 1264.83 ± 81.66 g and 5.331 ± 0.42 kg in Gp3. No statistical difference was observed among 3 groups in respect of DMI and TDNI g/ kg W^{0.75}. The DCP intake g/kg W^{0.75} in group Gp3 was 5.26 and significantly ($P < 0.01$) higher than the other 2 groups. The gain in body weight of pregnant camels during the last 4 months of pregnancy was significantly ($P < 0.01$) different among 3 groups and was 1.01, 1.22 and 1.44 kg/d in 3 groups, respectively. The loss in body weight of pregnant camels on calving was to the tune of 14.79, 13.92 and 14.20 % in Gp1, Gp2 and Gp3 groups, respectively. The average birth weight of camel calves was 43.25, 42.33 and 44.25 kg in 3 groups, respectively indicating non-significant influence of nutrition level during pregnancy. The study indicated that the ration Gp1 providing 9.5% CP and 50% TDN may be fed to pregnant camels during the last quarter of pregnancy.

Key words: Birth weight, body weight loss on calving, calves, growth, nutrient utilisation, pregnant camels.



Nutrient utilization from clusterbean straw, supplemented with urea and *Prosopis cineraria* leaves in growing camel

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Abstract

A study was conducted in completely randomized design on 9 growing male camels to study the effect of supplementation of 2% urea (DM basis) and leaves of *Prosopis cineraria* (khejri) on iso nitrogenously to clusterbean straw (*Cyamopsis tetragonoloba*) fed respectively, to group II and III and straw only to group (I) as a sole feed. Total dry matter intake and digestibility of CF were significantly higher in group III than other groups. However, digestibility of DM, OM, CP and values of blood urea and total protein was similar and significantly ($P < 0.05$) higher in group II and III compared to group I. Calculated cost of feed in corresponding groups was 12, 13.56 and 16.77 Rs/d/animal. Significantly lower cost of feed was observed in group I fed clusterbean straw whereas cost of available nutrients was significantly ($P < 0.05$) lower in urea supplement group.

Keywords: Clusterbean straw, *Prosopis cineraria*, camel calves, cost



Effect of groundnut chara feeding in combination with guar phalgati on intake, digestibility and nitrogen recycling pattern in camel

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Abstract

Comparative performance of growing camel calves (9; age approximately 4-5 years, BW 418±19.02 kg) fed guar chara (group 1) alone and in combination with 50% groundnut chara (group 2) and groundnut chara (group 3) as a sole feed was evaluated in terms of digestibility of nutrients feed efficiency and economics of feeding. No significant difference was observed between groups 2 and 1 in respect to DMI. Whereas, DMI% of body weight as well as per kg metabolic body weight was significantly higher in group 3 fed groundnut chara than that in groups 2 and 1. Similarly, digestibility coefficient of proximate nutrients except CF was significantly higher in group 3 compared to other groups, while no significant improvement in digestibility of DM, OM, CP, NFE and ADF were observed in groups 2 and 1. The ADG and change in body weight were nonsignificantly different among the treatments.

Calculated dietary nitrogen recycled to rumen was 56.52, 45.64 and 36.12%, respectively, in groups 1, 2 and 3. The cost of feed was 12.4±0.80, 16.23 ± 1.92 and 21.03 ±2 .17 Rs/d/animal in respective groups. Although the cost of feed was lower in group I but feed/kg gain were significantly higher (41.42 ±2.4 7) in comparison to groups 2 (26.63±3.85) and 3 (20.65±1.67). The results of study indicated high feed utilization efficiency of groundnut chara in comparison to guar chara and further supplementation of 50% groundnut *chara* to *guar chara* improved intake and efficiency of nutrients utilization and are also effective and economic mean to optimize the utilization of guar chara for better animal performance.

Key words: Camel, digestibility, groundnut *chara*, guar, intake, nitrogen recycling



Field management survey study of camel in western arid zone of Rajasthan

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Abstract

To study the traditional practices followed by camel keepers at farmer door extensive village survey in eight districts of state under zone I, II, III, IV designated as Arid western plain (Bikaner, Jaisalmer). Irrigated north-western region (Hanumangarh, Ganganagar). Transitional plain of inland drainage (Churu, Nagour) and Transitional plain of Luni basin (Pal., Jodhpur) was carried out. Camel keepers preferred natural service and choose breeding bull according to reproductive characteristics of female. About 36.56 % camel owners use breeding bull from other tolas or Panchayat 29.06% where as 21.88% uses their own breeding bull. Majority of camel keeper (73.44%) preferred to have calving at home and 2.56 % preferred it in tola. According to respondents (82.50%), reproductive problems in camel are not much concern. The average age of mating is 5-6 and 4-5 years, respectively, in male and female camel in four zones. Number of service per conception varied between 1 to 3 for different zones of Rajasthan. Inter calving period was found to be 2 years for majority of camel keepers and average lactation length reported was ranges from 10-14 month. Special ration are given to male camel before or after mating by 40 % and 10 female camels by 30 % respondents.



Trace mineral and vitamin C content of camel milk: a comparative study

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Abstract

The concentration of micro minerals such as Cu, Co, Zn, Fe, Mn, Mo, Pb and vitamin C were determined in camel milk and compared with those of cow, goat and sheep milk. The average concentration (mg %) of Cu, Co, Zn, Fe, Mn, Mo, Pb and vitamin C were 0.156 ± 0.21 , 0.071 ± 0.07 , 0.071 ± 0.07 , 0.50 ± 0.39 , 0.059 ± 0.07 , 0.070 ± 0.1 , 0.022 ± 0.01 and 3.23 ± 0.09 , respectively in camel milk. Compared to cow milk, the mean values of vitamin C were higher in camel milk. The study showed that camel milk contains considerably less iron than cow milk while the content of Cu, Co, Zn was about the same level. Mn was found to be lower in comparison to cow, goat and sheep and the Mo and Pb content in camel milk were quite similar to other bovine milk.

Keywords: Camel milk, micro mineral constituents, vitamin C



Comparative studies on micro-mineral profile in camels

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Abstract

The study was conducted in 15 camels comprising of 5 pregnant females in last month of pregnancy (Gr. I), 5 calves aged 1 month (Gr.II) and 5 dry female camels (Gr. III). The neonatal camel calves were maintained on dam's colostrum for the first 3 days and later with the milk of their corresponding dam. Gr. I and Gr. III camels were maintained under normal feeding schedule with ad lib drinking water. In all these animal micro-mineral or trace mineral estimations viz., copper, iron, zinc, molybdenum, manganese and cobalt were done using Atomic Absorption Spectrophotometer. No significant variation between groups was noticed for minerals copper and molybdenum. Significant difference ($P < 0.01$) were noticed in the pregnant female in last month of pregnancy compared to dry females in iron, zinc, manganese and cobalt concentrations. The iron and zinc levels showed significant variation at $P < 0.05$ and the manganese and cobalt showed significance at $P < 0.01$ in Gr. II and Gr. III.



Effect of management systems on the performance of dromedary camel calves reared under organized farm condition

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Abstract

Camel calves (10), 7- to 10-month-old, were allotted randomly into 2 comparable groups of 5 each. First group was reared under intensive system of management (ISM) with concentrate supplementation. The second group was reared under semi-intensive system of management (SISM) and allowed daily grazing/browsing for about 6 to 7 h. All animals were offered moth crop residue as manger feeding. Watering was done once daily for all camels in both the groups. After 180 days of trial period, mean body weight and average growth rate were significantly increased in ISM as compared to SISM group. The average total gain was almost double in ISM than SISM. The crop residue intake significantly ($P < 0.05$) varied between the groups. Various biometrical parameters, viz. body length, heart girth, height at withers, hump circumference (horizontal), neck length and leg length (fore) significantly increased in ISM as compared to SISM group. Significant variation was also observed for leg length (hind), foot pad length and width (fore and hind) between groups. Significant and positive correlation between body weight and all biometrical parameters were observed for both the groups. The level of triglyceride and total protein significantly increased in ISM as compared to SISM group. Comparatively higher level of urea was found in ISM than SISM. The level of globulin significantly increased in ISM as compared to SISM. The levels of calcium and phosphorus were slightly higher in ISM as compared to SISM. The first in order of behavioral preference were *ganthia* (*Dactyloctenium aegypticum*), phog (*Calligonum polygonoides*) and khejri (*Prosopis cineraria*) among grasses, bushes and trees, respectively. The total feeding cost per calf for 180 days was more in ISM than in SISM group, whereas the total cost per kg body weight gain was quite less and economical in the former as compared to the later group.

Key words: Behaviour, Camel, Economics, Farmers, Growth, Management systems



Socio-economic aspects of dromedary camel management in hot arid desert ecosystem

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Abstract

Present socio-economic aspects of camel management were investigated in 11 selected villages of Bikaner district (two tehsils) in Rajasthan. Analysis of data indicated that most of farmers involved in camel rearing were old-age category who engaged their animals in carting operation. The overall total fixed and variable costs of whole camel carting system were Rs 5056 and Rs 39070, respectively with actual profit of Rs 32419 whereas PBP and B.C.R were 8.64 month and 1.73. Objective of camel-rearing significantly differed between camel keepers and camel merchants. Number of camels significantly influences rearing practices in these areas. Mostly small-category farmers fed their camels by sending at range land. The category of farmers significantly influenced feeding practices. The maintenance of regularity and provision of free access of water to camel seems to be limited. Majority of farmers kept their camels under the tree shade and used to replace loose sand dune with fresh lot to avoid health disorders. Currently maximum of old-aged farmers and a few of young were consuming camel milk in this region. Camel also played important role in socio-cultural aspects. A predominance of respondents were having low scientific, extension orientation and mass media participation. Most of carcasses were disposed off at distance of about 10 km away from residential area, in jungle or in open places. Decreasing availability of grazing pasture was first and foremost constraint for camel rearing. For sustainable camel production, it is necessary to develop suitable programme of natural resource management, low- cost rearing and health-care practices, as well as market facilities for camel products and by products.

Keywords: Camel, farmers, management, production, socio-economic



Studies on attributes of hair and production potential of camel reared in semi-intensive management system

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Abstract

Annual hair yield data from 1038 Indian dromedary camels of 3 breeds (Bikaneri, Jaisalmeri and Kachchhi) from 5 different age groups were recorded. The Bikaneri breed of camel produced significantly ($P<0.01$) higher annual hair yields than Jaisalmeri and Kachchhi breed camels and young camels had significantly ($P<0.01$) higher yields. The male camel produced significantly ($P<0.01$) heavier annual hair clip than females in all breeds and at all age groups. The longest staple length was found in Bikaneri breed followed by Jaisalmeri and Kachchhi breed. The breed and body site significantly ($P<0.01$) influenced the staple length. The mean hair diameter of Bikaneri breed was minimum followed by Jaisalmeri and Kachchhi. The hair of male camel was finer than that of female camel. The breed, sex and body site significantly ($P<0.01$) affected the hair diameter. The hair diameter in all types of hairs obtained from various sites was finest from Bikaneri breed camels followed by Jaisalmeri and Kachchhi camels. It can be concluded that Bikaneri breed is superior in hair quality attributes as compared to Jaisalmeri and Kachchhi breed and male camel of Bikaneri breed belonging to 3-year-age groups produced higher annual hair yield as compared to camels of other breed, age and sex.

Keywords: Camel, hair attributes, management system, rearing.



Comparative genomic organization of camel beta casein gene promoter: a computational gene regulation study

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Abstract

Camel milk protein have pronounced differences in quantitative distribution of caseins as compared with other species. We have analysed the structural organization of β -CSNGP 5' flanking sequences of camel, bovine and porcine species. The camel β -CSNGP comprised of 1763bp of 5' flanking regions and -892 to -650, -523 to -230 and -152 to -11. The basal promoter showed the presence of TATA box, CAAT box, binding motif for Oct 1, Oct 2, Oct 4, AP2, GR half YY1, C/EBP and MGF/STAT5. The promoter had insertional sequences which are shown to be the binding sites for C/EBP and PRL. A camel β casein enhancer region at -1762 to -1371 showed presence of transcription factor binding motifs for C/EBP, MGF/STAT5, GR half, Oct2, Oct3, AP1 and SP1. The overall comparison of structural organization of camel β -CSNGP for key regulatory element such as GR half, YY1, Oct1, Oct2, Oct3 and SP1 showed presence of multiple number of each transcription factor binding motif as compared to bovine species that may be resulting in higher expression of β -CSN gene in camel. The striking difference has been the clustering of 6 GR halves in porcine β -CSNGP and 6YY1 motifs in camel β -CSNGP clearly suggested that prolactin and glucocorticoid with their co-activators of transcription play a key regulatory role in over expression of β -CSN in Camel and porcine species, respectively. These findings facilitate the transgenic researchers to concentrate and simplify their experiment targeting few key regulatory elements.

Keywords: Camel, gene regulation, glucocorticoid, prolactin, transcription factor binding motifs, β –casein gene promoter (β -CSNGP)



Evaluation of oral formulation as humoral immune response modifier in dromedary camel

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Abstract

An attempt was made to assess immunomodulatory properties of an oral formulation comprising of pulp of Aloe Vera (Gwar Patha), Aswagandha (*Withania somnifera*) Amla (*Embolica officinalis*) *Tinospora cardifolia* (Giloy) in equal proportion with jaggery as a palatable agent in dromedary camel. Twelve animals divided in to two equal groups were given oral formulation @ 3 mg/kg body weight once in a day for 15 days. Five days interval laboratory assessment for humoral response through globulin concentration and A:G ratio gave encouraging results with additional advantage of safe use.



Sarcopticosis in dromedary camel-clinical observations and its therapeutic management

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Abstract

The present study was undertaken to record clinical findings and evaluate therapeutic efficacy of an indigenous formulation for sarcopticosis in dromedary camel. The characteristic skin lesions included excoriation, erythema, cracks, bleeding, thickening and wrinkling, alopecia and hypermelanosis. In camels nostrils, lips, orbit, brisket, pre-and post-scapular and femoral region, brisket, sternum, thighs, tail, perineum, knee and hock joints were mostly affected. Local application of indigenous formulation resulted in clinical and parasitic cure within 10 days and the cure rate was cent percent. Reversible trend of eosinophilia, hypoproteinemia, hypoalbuminemia and A/G ratio was recorded in treated animals.

Keywords: Camels, indigenous formulation, sarcopticosis



Viability Assessment of camel sperms using Hoechst 33258 stain

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Abstract

The proportion of living sperm in semen from 11 Jaisalmeri camels was assessed by means of a fluorescence staining technique using the Hoechst 33258 stain. The objectives were to study the head membrane integrity (%) of the spermatozoa and to make its comparison with the sperm motility (%) obtained with phase-contrast microscope. The head portions of dead spermatozoa get blue staining and give bright fluorescence under the microscope. The proportions of living and dead sperm in camel semen were readily identified through the use of Hoechst 33258. Mean sperm head membrane integrity ($21.18 \pm 6.38\%$) was non-significantly higher in comparison to the mean motility ($17.00 \pm 5.12\%$).

Keywords: Camel, Hoechst 33258 stain, sperms, viability assessment



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Physical characterisation, hematological and mineral profiles in bactrian camels

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Abstract

The population of the bactrian camels in the Nobra valley were 110 at the end of the year 2000. The physical measurements were found to be greater in male as compared to female camels. The haematological and mineral profiles of both the sexes are presented.



Mathematical function for the prediction of body weight gain in dromedary

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Abstract

Body weight gain in 2 sexes and 4 genotypes of dromedary from birth to 20 years of age was analysed for a period of 21 years. The average per month body weight gain in the Indian dromedary ranged from 19.46 to -3.86 kg, respectively from birth to 20 years of age. The breed and sex effects were largely non-significant ($P>0.05$). The body weight gain in camels was maximum during first 6 months of age, precisely, 48.26 kg in the 1st quarter and 58.39 kg in the 2nd quarter. The body weight gain continued up to 11 years of age and thereafter, it was more or less negative. The linear, logarithmic, quadratic, inverse and cubic functions were derived to explain the age-weight gain relationship in Indian dromedary and the respective R^2 values were 0.702, 0.892, 0.795, 0.651 and 0.834. It is quite evident from the analysis and curve fitting that the logarithmic function explains the per month body weight gain in camel for the entire life time to the extent of 89.2 %, hence the equation $Y = 21.0934 - 4.3128 \ln(x)$ can reliably be utilised for the prediction of body weight gain of camels of different sexes and genetic groups for all purposes including the meat production potential and performance evaluation.

Keywords: Body weight, camel, logarithmic regression, mathematical function



Plasma minerals profile of camels in different physiological states

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Abstract

Ten samples collected each from dry females, rutting male camels and pregnant females raised on ad-lib dew bean straw and 7-8 hr/d grazing without supplement were analyzed to document the variations in plasma profile of some macro and micro minerals (C, Na, K, Mg, Cu, Co, Fe, Zn, Mo, Mn, Pb). As compared to dry female, significant decline of Ca and K levels ($P < 0.05$) in rutting male, Cu, Zn ($P < 0.05$) in pregnant camel and of Na, Mg, Fe ($P < 0.01$) in both were observed. However, increase in Co level due to physiological status and no changes in Mn and Mo concentrations were observed. Considering the reported range of plasma mineral concentrations, the respective mean values of K, Co, Zn, Mo, Mn, and Pb were within the normal reported range while, plasma values of Ca, Mg, Na and Cu were below normal values indicated need of supplementation of mineral mixture to meet the increased metabolic demand during stress period.

Keywords: Mineral, plasma, camel



Effect on the growth rate and immune status in neonatal camel calves under different feeding practices

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Abstract

The present study was conducted in 18 newly born camel calves, which were maintained under colostrum feeding for first 3-4 days and later on milk from their respective dams *ad lib* until 3 months of age. The calves were divided randomly into 3 groups of 6 each. The group I and III calves were fed on colostrum and milk by natural sucking method of all the 4 teats. Group II calves were maintained by natural sucking method but on only one lateral side. The Group III (treated group) received an herbal immunomodulator (trade name: RESTOBAL*) @ 20 ml per os daily for 5 days at 45 days of age. The immune status was measured in the neonatal camel calves immediately after birth, at 12 hourly intervals till 3 days, at weekly intervals till 4th week and fortnightly intervals till 3 months. The body weight in the camel calves was recorded immediately after birth, 3 days and later on as per the periods mentioned above. The results indicated improvement in immune status and average growth rate (based on improvement in body weight) in treated calves from 2 to 3 months of age compared to group I and II. This suggests that apart from feeding milk alone to camel till 3 months of age some supplements/immunomodulators must be given for better growth rate and the camel calves should be made to suckle all the 4 teats.

Keywords: Colostrum, dromedary camels, feeding pattern, growth rate, milk, passive Immunity



Isolation and identification of bacteria from lower genital tract of female dromedary camel

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Abstract

Twenty six female adult multiparous dromedary camels belonging to the herd of National Research Centre on Camel, Bikaner were taken for the present study before first mating at the onset of breeding season. Vaginal smears/samples were taken with sterile swabs using a swab holder of 30 cm length. The samples were taken before first mating during the initial period of breeding season. Samples were processed by standard procedures and isolated samples were identified by primary and secondary biochemical tests along with their growth characteristics. Antibiotic sensitivity test was applied by disc diffusion method. Out of 26 samples 4 samples (15.4 %) failed to show any growth despite of duplicate culture, 8 (30.8%) samples had only one isolate, 11 (42.3 %) samples had 2 isolates, 2 (7.7 %) samples had 3 isolates and only 1 (3.8 %) sample had 5 isolates. Out of these 41 isolates, *E. coli*, *Staphylococcus spp.*, *Pseudomonas spp.*, *Bacillus spp.*, *Micrococcus spp.*, *Serratia spp.*, *Klebsiella spp.*, *Salmonella spp.*, *Corynebacterium (Actinomyces)*, *Pasturella spp.*, and *Proteus spp.* constituted 21.9, 14.6, 14.6, 9.8, 7.3, 7.3, 7.3, 4.9, 4.9, 4.9 and 2.4 per cent, respectively. Gram negative bacteria (63.4 %) were found in slightly higher percentage than Gram positive (36.6%). Low bacterial yield (No. of isolates/sample) reflects otherwise sterile genital tract.

Key words: Bacteria, genital tract, vagina, camel, dromedary



Ultrasound evaluation of ovarian response to photoperiodic control measures in *Camelus dromedarius*

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Abstract

The present study was carried out with two objectives, (a) the use of ultrasound scanners to study the effect of 'mask on eyes' as a photoperiodic control measure for folliculogenesis in female camels. (b) Use of blood progesterone assays to monitor ovarian changes in camels. Fourteen female camels aged 7-11 years were used for the present experiment. Seven were studied for the effect of a mask over the eyes (for six hours daily) as a photoperiodic control measure on ovarian activity and the remaining seven were kept as controls. Ovaries were examined by ultrasound at weekly intervals for seven weeks during the non-breeding season. Camels were mated with virile stud when a follicle (≥ 0.9 cm diameter, ovulating size) was visible on either of the ovaries. Ovaries were monitored for ovulation up to 48 h post-mating by ultrasound at 12 hourly intervals and at 20, 30 and 40 days post mating to ascertain pregnancy. A commercially available RIA kit was used for serum progesterone assay on samples obtained at 0, 7, 15, 30 and 45 days of mating. No follicle was observed in camels before treatment and in treated (masked) or untreated camels during the first week of treatment. By the third week 100% camels in the treatment group evidenced measurable small follicles (0.5-0.89 cm, 6/7) or follicles of ovulating size (≥ 0.9 cm, 1/7). Follicles of ovulating size were observed in 28.6, 14.3, 14.3 and 14.3 percent camels by 4th, 5th, 6th and 7th week of treatment. Fifty percent (3/6) of the camels became pregnant. The serum plasma progesterone level increased after ovulation and remained higher than 1.0 ng/mL in pregnant camels. In the control group one camel showed a follicle (0.6 cm diameter) at the 5th week, which did not reach ovulating size. The results of the present study indicate that protecting eyes from sunlight one or two months ahead of the breeding season stimulates follicular growth in camels and pregnancy can occur in these camels when mated.

Key words: Ovary, photoperiodicity, progesterone, ultrasound, *Camelus dromedarius*



Biometry of frozen-thawed sperm from Indian Jaisalmeri Camel

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Abstract

The objective of the present study was to measure various biometric end points of frozen-thawed sperm in Indian Jaisalmeri camel (*Camelus dromedarius*), as sperm morphometry in combination with other objective traits which can be useful for developing a fertility index. The sperm head's greatest length varied from 8.18 to 8.84 μm , whereas its width ranged from 4.82 to 5.58 μm . The mean value of sperm head area and perimeter for 7 bulls was 39.75 μm^2 and 28.44 μm respectively. The ratio of sperm width to length varied from 0.56 to 0.67 with a mean value of 0.63. Based on mean values of sperm tail length mid piece length and its width, the 7 bulls were categorised into 3, 4 and 2 groups, respectively.

Keywords: Biometry, frozen-thawed, camel, Jaisalmeri, morphometry, sperm.



Comparative study on camel management system for economic sustainability

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Abstract

Two trials were conducted with different management practices to compare 2 management systems. First and second trials were conducted by providing guar crop residue and moth crop residue as manger feeding, respectively for 182 days each. Five camel calves belonging to NRCC were allotted randomly into each group of management system. First group was reared under intensive system of management (ISM) and 2nd group was reared under semi-intensive system of management (SIM). The mean body weight and average growth rate were significantly ($P<0.01$) increased in SIM as compared to ISM group at the end of each trial. The average total gain was higher in SIM than ISM group in both trials. The body water was significantly ($P<0.05$) lower in SIM as compared to ISM group. The body fat, protein and ash (%) were significantly ($P<0.05$) higher in SIM as compared to ISM group. The nutrient, energy deposition in terms of protein was significantly ($P<0.01$) higher in SIM than ISM group. The total deposition was significantly ($P<0.01$) increased in SIM than ISM group. The body length, heart girth, height at wither, neck length, hump circumference (horizontal), leg length (fore and hind) and foot pad length (fore) were significantly ($P<0.01$) increased in SIM as compared to ISM group after end of both trials. The hump circumference (vertical), foot pad width (fore and hind) varied significantly ($P<0.05$) between groups for both trials. The level of urea significantly ($P<0.05$) increased in ISM than SIM group in 2nd trial but BUN level significantly ($P<0.05$) increased in ISM than SIM group in 1st trial. The average level of serum calcium and phosphorus significantly ($P<0.05$) increased in SIM than ISM group in 2nd trial. The level of total protein, albumin and globulin were significantly ($P<0.05$) increased in SIM as compared to ISM group in 2nd trial. The total feeding cost per calf for 182 days was high in ISM than in SIM group for both trials. The total cost per kg body weight gain was quite less and economical in SIM as compared to ISM group in both trials.

Keywords: Body composition, camel, economics, farmers, management system, performance



Camel rearing in different management practices under arid ecosystem

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Abstract

Ten camel calves (14 to 18 months) were allotted randomly into two groups of Intensive (IMP) and Semi intensive (SMP) for 240 days trial. After feeding trials mean body weight and average growth rate were significantly ($P<0.01$) increased in SMP compared to IMP group. The various biometrical parameters were significantly ($P<0.01$) increased in SMP compared to IMP group. The concentrations of Iron, Zinc and Copper in serum of calves were low in IMP as compared to SMP group. The first in order of preference was Khejri (*Prosopis cineraria*). Total feeding cost per kg body weight gain per calf was quite less and economical in SMP as compared IMP group. The overall performance of SMP group was better and economical as compared to IMP group.



Growth characteristics, economics and hair mineral status of camel calves reared in different systems of management

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Abstract

Management systems were compared by conducting 2 trials with different feeding practices. Trials 1 and 2 were conducted by feeding *guar phalgati* and *moth chara* as manger feeding, respectively, for 165 days each to 5 camel calves each under intensive system of management (ISM) and semi-intensive system of management (SIM). Total gain in body weight was higher in SIM than ISM group in both the trials. Mean body weight and average growth rate significantly increased in SIM as compared to ISM group at the end of both the trials. The mean moth chara intake was significantly ($P<0.05$) more in ISM than SIM. The important hair minerals (calcium, magnesium, copper, zinc, iron and manganese) increased significantly in SIM as compared to ISM group. The manganese status varied significantly ($P<0.05$) between groups in *moth chara* trial. Feeding cost/calf/day and total cost were high in ISM than SIM group in both the trials. Total cost/kg body weight gain was quite less and economical in SIM as compared to ISM group. The study indicated SIM better than ISM for economic rearing of camel calf.

Keywords: Camel, economics, farmers, growth, hair, management system mineral



Standardization of duration and frequency of an indigenous formulation against mange in dromedary camel

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Abstract

In the process of developing herbal drug formulations against Sarcopticosis in dromedary camel, one of the so far developed drug formulation, was put on trial for standardization with respect to duration and frequencies of its application in naturally occurring clinical cases of mange. A total of 5-7 applications were found to be effective enough when applied once in a day daily initially for 3 days followed by alternate application for rest of the days. In less severe cases, 3-5 days interval of application may be attempted with careful monitoring of disease.

Keywords: Herbal formulation, dromedary camel, mange



Differentiation of *Staphylococcus aureus* strains based on 16S-23S ribosomal RNA intergenic space polymorphism

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Abstract

Discrimination of *Staphylococcus aureus* strains, isolated from camel abscesses and mastitic milk of camel, cattle and goats, on the basis of 16S-23S ribosomal RNA intergenic space polymorphism was carried out. Two sets of primers were used for amplification of DNA of intergenic space; the one having a highly conserved sequence in eubacteria 123S rRNA transcript, while the other having less conserved sequence of 16S rRNA, reported earlier by other workers. Of the two sets of primers used, amplification could be achieved with one set of primers. Of 60 strains of *S. aureus* tested, amplification could be achieved in only 18 strains. In these strains the most frequent bands of DNA were of 350, 500, 750 and 1500 base pairs. Polymorphism was noted in the number of the rRNA transcripts and size of the 16S-23S rRNA intergenic space, as evident by variable band pattern in different strains of *S. aureus*.

Keywords: Ribosomal RNA, 16S-23S rRNA intergenic space, *Staphylococcus aureus* .



Evaluation of therapeutic efficacy of herbal formulation with and without levamisole against mange in dromedary camel

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Abstract

A herbal formulation (Lemon, onion, camphor, turmeric with sweet oil) was evaluated for its therapeutic efficacy in view to popularize ethno-medicine on allopathic drugs on naturally occurring cases of sarcopticosis in dromedary camel. The drug was found to possess good mangicidal properties as observed collectively on skin scrapping examination and recovery from different symptoms viz. itching, thickening and wrinkling of skin. Comparative assessment of efficacy of the herbal drug alone and in combination with levamisole indicated for combined therapy for better results.

Keywords: Herbal formulation, mange, camel, and levamisole



Reproductive performance of Indian camel breeds

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Abstract

A total of 28, 139 and 250 records belonging to 2000 to 2008 were analysed to study the age at first calving, calving interval and gestation length in the Indian camel breeds. The age at first calving was 2020.02 ± 59.88 days. Calving interval was 676.71 ± 10.60 days and gestation length was 384.12 ± 0.98 days. Though the effect of breed was nonsignificant ($P > 0.05$) on age at first calving, there exists enough variation and hence scope for the improvement in attaining the puberty at an early age. Proper feeding, management and individual attention are some of the aspects which can be of great use in improving the reproductive efficiency of the camel herd. Induction of puberty in prepubertal females, postpartum breeding and non-seasonal breeding can also be attempted to reduce the age at first calving and calving interval in female camels

Keywords: Age at first calving, breeds, calving interval, camel, gestation



Amplification and RFLP of Exon 2 of MHC-DRB3 locus in livestock species

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Abstract

The restriction fragment length polymorphism of exon 2 of MHC DRB3 locus in Rathi cattle, Magra sheep and French donkey was studied using HinfI, RsaI and HaeIII. restriction enzymes. A fragment of 308 bp was successfully amplified in cattle (BoLA), donkey (ELA) and sheep (OLA). The digestion of BoLA - DRB3 fragment with HinfI revealed heterozygous status at this locus in all the animals under investigation. The molecular size of fragments were 261, 47 and 167, 94 and 47 bp. Analysis of ELA (221 and 87 bp) and OLA DRB3 (212 and 96 bp) fragments revealed homozygous status at this locus. Digestion with HaeIII in donkey resolved two fragments of 169 and 139 bp. Rsa I revealed heterozygous status in all three species. No intra-species variation was detected. The fragments observed in cattle and sheep were of the same size (308 and 160, 81, 67 bp) indicating the genetic similarity in the two species. In French donkeys the fragments resolved were of 308 and 138, 85, 85 bp.



Camel Dairying: An Indian perspective

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Abstract

An investigation in Rajasthan and adjoining Madhya Pradesh was carried out to assess the present status of production and sale of camel milk in India. The statistics revealed that about 21562 females are in milk at a time, producing about 23080 thousand litre/annum. The camel milk is providing livelihood to about 3218 families with average annual income of about Rs 60000 and sustaining 56 360 camels in its natural habitat. If the above model is adopted, it is expected that at any time about 166830 females will be in milk producing about 201 thousand tones/year in Rajasthan. The milk collection is expected to increase by about 8- times its present level and the share of camel milk in the total milk produced in the state may reach to 2.5%. This may act as a main criterion for sustenance of camel breeds in the present era of diminishing draught utility.

Keywords: Camel, Mewari, milk, production, conservation



RFLP analysis of k- casein gene in livestock

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Abstract

Amplification of a 379 bp fragment of CSN3 locus was successfully accomplished in Rathi cattle, indigenous buffalo and Magra sheep. The Rathi cattle (*Bos indicus*) under investigation were all of AB type (Hinfl / HindIII). The indigenous buffaloes studied were all of homozygous BB genotype and hence can be used for the improvement of populations having very low frequency of this favourable allele. Amplification of k-casein locus could not be achieved in camel (*Camelus dromedarius*) using above primers despite of the close homology between camel and bovine in the 5' flanking region adjacent to the transcriptional start site of kappa-casein. The status in sheep (*Ovis aries*) was altogether different from cattle and buffalo at this locus, reflecting the differences in the casein production properties, the same can be further substantiated by sequencing of CSN3 fragment and identification of the amino acid substitution sites.



Comparative biochemical and mineral profile of female Indian dromedaries during breeding season

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Abstract

Blood biochemical and mineral profiles of 8 female dromedary camels (3 fertile, 5 non -fertile) were studied at fortnightly intervals during different breeding phases (prebreeding, breeding and after breeding) for at least 180 day in relation to fertility with feeding of cluster bean straw *ad-lib* and concentrate mixture containing 14% DCP and 70% TDN along with area-specific mineral mixture to fulfill the energy, protein and mineral requirements. The camels were bred by natural service and pregnancy was monitored by tail curling method and then by rectal palpation. No statistical difference was observed for all estimated parameters between 2 groups throughout breeding period except P which was significantly lower in fertile group than that of non-fertile camels. Except urea-N, Mg and Cu values, all parameters showed decreasing trend from their respective initial values at pre-breeding period. Significant decline of Na and Zn levels in non-fertile and K and Mn in both the groups were observed. The results suggest that female camels showing better fertility had slightly better Ca: P ratio, urea N as well as concentration of Cu and Mg compared to non-fertile camels at time of breeding.

Keywords: Biochemical parameters, breeding season, dromedary camels, mineral profile



Effectiveness of medicinal herbs against dromedary mastitis isolates

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Abstract

Screening of nine medicinal herbs viz, Tulsi (*Ocimum sanctum*), Ashwagandha (*Withania somnifera*) Datura (*Datura metel*), Peepal (*Ficus religiosa*), Pardesi Kiker (*Prosopis juliflora*), Anar (*Punica granatum*) leaves, Garlic (*Allium sativum*) bulb, Karela (*Momordica charantia*) fruit, Ginger (*Zingiber officinale*) root for antibacterial activity against 76 bacterial isolates from camel intra mammary infections, which comprised of *Staphylococcus* (St.) *epidermidis* (34), *St. aureus* (16), *Corynebacterium spp* (9), *Micrococcus spp* (4), *Bacillus spp* (5) and *Escherichia coli* (8) revealed 100 percent sensitivity against crude and methanol extract of anar and pardesi kiker leaves. Datura, ashawagandha and garlic were also found to possess good antibacterial activity, whereas crude juice of peepal exhibited 100 per cent activity against *E.coli* isolates. On exposure of methanolic extract of these plants to UV rays antibacterial activity of kiker and anar was unaffected whereas all other plants failed to show any antibacterial activity. *In vitro* MIC of methanol extract of anar leaves varied from 3.75 to 10 μ /ml and for pardesi kiker from 1.25 to 8.75 μ /ml. No significant synergistic effect was observed by combining two plants extracts.

Keywords: Camel, mastitis, medicinal herbs



***In vitro* antibacterial activity of medicinal plants**

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Abstract

Fresh leaves juices of five traditionally used medicinal plants viz Peepal (*Ficus religiosa*), Tulsi (*Ocimum sanctum*), Anar (*Punica granatum*), Ashwagandha (*Withania somnifera*), Datura (*Datura metel*) were tested for antibacterial activity by the agar gel diffusion method, Overall maximum sensitivity was exhibited by *Punica granatum* and *Datura metel* (97.7% each) followed by *Withania somnifera* (88.8%), *Ficus religiosa* (73.3%) and *Ocimum sanctum* (72.2%).



Effect of Clomiphene citrate and super - ov to augment ovarian activity in pre pubertal camel heifers

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Abstract

In the present investigation the use of porcine FSH (Super - OV; group I) and clomiphene citrate (group II) was observed on induction of ovarian activity and fertility in prepubertal she camels (three years \pm 2 months). All the animals in group I responded to the treatment and eight out of eleven heifers conceived (72.7%). Only one (out of four) animal responded to the treatment in group II but failed to conceive.



Efficacy of vaginal electrical resistance (VER) measurement for evaluation of follicular activity in *Camelus dromedarius*

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Abstract

VER was studied in female dromedary camels (n=14) concomitant to ultrasound examination at 2 days intervals to evaluate vaginal electrical resistance (VER) as an indicator of follicular activity and pregnancy. VER was recorded using a commercially available resistance probe and scanner was used for ultrasound examination. Females were mated with virile stud camels and the diameter of the follicle at the time of mating recorded. VER and ultrasound examinations were continued till day 30 after mating. Follicles of different diameters were recorded but the follicular growth wave was difficult to define. The growth of follicles in non-mated camels continued with follicles reaching up to 3.72 cm diameter. Ovulations did occur in the mated females even when the size of follicle was 0.8 cm at mating, however, only 50% of the matings resulted into ovulation when the follicle size was <1.0 cm. The use of heat detector for measurement of vaginal electrical resistance in dromedary camel did not give significantly different values, when there was no follicle, follicles with diameter < 0.5 cm, follicle with 0.8 to 0.99 cm, follicle \geq 1.0 cm, corpus-luteum and pregnant uterus.

Keywords: *Camelus dromedarius*, follicles, ultrasound, vaginal electrical resistance



Influence of rearing system on performance of camel calves

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Abstract

Ten camel calves were allotted randomly into two groups of intensive rearing system (IRS) and semi-intensive rearing system (SIRS) for 170 days experimentation. After 170 days of trial period, mean body weight and growth rate were significantly ($P < 0.01$) higher in IRS as compared to SIRS. Analysis of hair mineral status revealed significant differences IRS and SIRS group. The total feeding cost per calf for 170 days was more in IRS as compared to SIRS group. Intensive rearing system showed better result than semi-intensive rearing system showed better results than semi- intensive rearing system for economic camel calf management.



Scheduling of duration and frequency of an indigenous formulation against Sarcopticosis in dromedary camel

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Abstract

One herbal drug formulation named NRCC/FII was put on trial for scheduling the duration and frequency of application on naturally occurring clinical cases of mange in dromedary camel. A total of 5-7 applications were found to be effective when applied once in a day daily initially for 3 days followed by alternate application for rest of the days. In less severe cases a schedule of local one application daily for 2 days followed by 2 days interval application was found effective.

Keywords: Herbal formulation, dromedary camel, sarcopticosis



Mathematical function for the prediction of growth in Indian dromedary genotypes

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Abstract

Growth of Bikaneri, Jaisalmeri, Kachchhi and Arabcross (Arab×Bikaneri) camels from birth to 20 years of age was analyzed for the year 1984 to 2005. The average annual body weights, in the Indian dromedary were recorded as 37.1±0.3, 208.6±2.2, 269.1±3.5, 346.1±4.3, 403.4±4.3, 460.22±6.6, 510.2±7.4, 541.8±7.7, 569.8±8.3, 576.0±9.0, 575.9±9.4, 585.7±9.8, 569.8±9.6, 571.0±11.2, 566.5±11.2, 569.7±12.4, 547.6±12.3, 576.2±13.9, 569.8±16.6, 558.9±16.6 and 548.0±18.4 kg. respectively from birth to 20 year of age. The male sex was differentiated from the female sex at 24 months of age but the genetic groups were nonsignificantly different from each other except the Arabcross camels at some stage. It was observed that the camels attain their adult 8 years of age but the growth phase continues up to 11 years of age. The linear, quadratic, cubic, exponential and Gompertz function were derived to explain the age weight relationship in Indian dromedary genotypes and the respective R² values were 0.661, 0.964, 0.45 and 0.967. It is quite evident from the analysis that the cubic function explains the growth of camel for the entire life time to extent of 99.4%, hence the equation $Y = 73.2592 + 9.9072X - 0.0631X^2 + 0.000128X^3$ can be utilized for the estimation of body weight of camels of different sexes and genetic groups.

Keywords: Camel, cubic, gompertz, growth, mathematical function, regression



Effect of coagulants on preparation of camel milk paneer

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Abstract

The study was aimed at preparation of camel milk paneer by using different coagulants and evaluation of organoleptic characteristics of camel milk paneer prepared from different coagulants. Different percentages of citric acid and CaCl_2 were used. The paneer made from whole camel milk and precipitated with 0.5-1.0% citric acid along with 0.1-0.2% CaCl_2 effectively increased the binding of camel milk coagulum and the yields were found to vary between 9.0-10.0%. Highest taste and overall acceptability scores were observed for the paneer prepared by using 1.0% citric acid+0.1% CaCl_2 . The moisture and fat content in camel milk paneer were $51.24 \pm 5.21\%$ and $18.52 \pm 3.40\%$, respectively. Camel milk paneer can be stored upto 28 days at 4°C without any colour change.

Keywords: Camel milk, coagulants, evaluation, paneer



Performance of male breeding camels on different energy rations during rutting season

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Abstract

Eight male breeding camels of Bikaneri and Jaisalmeri breed of 10-14 years of age and 779 ± 36 kg body weight, allotted to 2 groups of 4 each, were offered feed blocks containing either bajra (Group B) or jaggery plus groundnut oil (Group O). Daily feed intake and body weights declined more in group B than in Group O camels during the experimental period. Variation for DM intake and water intake between the groups was non significant. Mean DM intake of 8.99 ± 0.91 kg/d or 1.29 ± 0.11 /100 kg body weight in group B was lower than the corresponding values of 9.89 ± 0.54 kg/d or 1.40 ± 0.09 kg/100 kg body weight in group O. Water intake. 5.76 ± 0.531 kg DM in group B and 5.44 / kg DM in group O were similar. DM digestibility was 75.86 ± 0.76 in group B and 72.00 ± 2.78 in group O. Nutrient digestibility and intake of DM, DCP and TDN g/kg $W^{0.75}$ did not vary significantly between the groups. Serum GPT, triglycerides and phosphorus were higher ($P < 0.01$) in group O than in group B. Nutrients utilization and camel performance were similar in both groups, although the cost of feeding was 71 % higher in group O than in group B.

Key words: Breeding male camels, Body weight. Nutrient utilization, Serum profile



Performance of breeding male camels fed sole dry moth fodder vis-a-vis complete feed blocks

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Abstract

The study was conducted to assess the variations in body weight, feed and water intake over a period of 5 months and adequacy of energy, protein and macro-minerals in breeding male camels fed dry moth fodder and complete feed blocks. Eight Jaisalmeri breeding male camels (5-9 years old; 681.13 ± 20.13 kg BW) were randomly divided into 2 groups of 4 each and were fed dry moth fodder (T1) and complete feed blocks (T2) consisting of dry chaffed *guar* straw (65.25%), dry chaffed groundnut fodder (20%), molasses (4%), *guar churi* (6%), wheat bran (4%), mineral mixture (0.25%) and common salt (0.50%) for 147 days. The camels of both the groups showed decrease in body weights and feed intake/100 kg body weight till 3 months after which improvement was observed. The body weight loss was non significantly higher in T1 (7%) than in T2 (3%). During digestibility trial, the daily DMI kg or DMI kg/100 kg BW were observed to be 4.6, 7.86 or 0.73, 1.08 in T1 and T2 respectively. Significantly higher digestibility coefficients of OM, CP and EE were observed in T2 than in T1 camels. Because of higher daily DMI and digestibility coefficients, the intake of DCP and TDN was 206.07 and 85.06% higher in T2 group than T1 group, former being significant. The mineral absorption of Na, K, P was significantly lower in T1 camels while reverse was true for Mg. The study inferred that feeding of complete feed blocks was better for camels in terms of body weight maintenance, energy, protein and minerals utilization.

Keywords: Breeding, Complete feed blocks, macro-minerals, male camels, nutrient utilization



Effect of induced hyperglycemia on insulin secretion in *Camelus dromedarius*

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National Research Centre on Camel, Bikaner 334001

Abstract

The serum insulin level in *Camelus dromedarius* (n=2) were investigated at different intervals after infusion of 20% dextrose solution i.v. @ 0.4 g/kg b.wt. within a period of 15 min. The insulin level rose from 6-8 mIU/l to 12.0 and 12.5 mIU/ml within four min of the glucose infusion, then, rose to the peak level of 23.5 and 18.5 μ IU/ml respectively at 2 h of infusion and then declined attaining values similar to 0 h and 8 h after infusion. The results suggest that camel respond to glucose infusion by elaborating insulin release from the islets of Langerhans cells in the pancreas.

Keywords: Camel, Glucose infusion, insulin



Work performance of dromedary camels on multipurpose tool carrier

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Abstract

The adult camels (n=10) in the similar age group weighing 618 kg were trained to pull the multipurpose tool carrier machine in the farm area for tillage operation during March 2010. The average area ploughed was 2200 m² per hour at an average draught power of 40 kg varying highly among animals. The endurance time varied between 60-90 minutes and the camels fatigued thereafter. There was a significant change (P<0.05) in the physiological responses viz: rectal temperature (degree centigrade), respiration and pulse rate was 36.47 ± 0.148, 37.63±0.116; 15.6±0.306, 18.8±0.133; 45±0.333, 49±0.333 before and after the work, respectively. The blood serum was collected to analyse the changes in the biochemical attributes after tilling work. The serum glucose, lactate, cholesterol and aspartate transaminase activity changed significantly (P<0.05) after the work.

Keywords: Camel, draught, endurance, tilling, multipurpose tool carrier



Effect of strategic supplement on milk yield and its composition, growth of calves and economics in dromedary camel- a farmer door study

N. Saini, B.D. Kiradoo, A. K. Lukha, S. Vyas and K.M.L. Pathak

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Abstract

A study of 120 days duration was conducted in Hadala village of Kolayat tehsil of Bikaner district in Rajasthan state to study the effect of the strategic supplementation of deficient nutrients in basal diet of lactating camels at farmer door. Six newly calved lactating camels of 3-6 parity on an average 4-5 lit/d milk yield were selected and distributed equally into 2 groups. Camels were maintained as the practice followed by the farmers routinely with feeding of cluster bean straw ad lib (Gp I) and barley grain 1 kg/camel/day with area specific mineral mixture, in addition to straw as a source of energy (Gp II). Significant improvement in serum total protein and globulin were observed due to improved feeding. Similarly milk production and yields of protein, fat and SNF per kg milk was significantly ($P < 0.05$) higher in Gp II compared to Gp I. Growth of calves was also significantly ($P < 0.05$) higher in Gp II than Gp I in terms of body length, height at withers and heart girth. It was demonstrated that limited amount of supplements in existing practice by scientific intervention i.e., energy through barley grain to basal diet resulted in increased milk yield and income of camel rearers and also had positive effect on health and milk composition of dams. There was good growth of calves.

Keywords: Barley grain, calf, camel, camel milk yield, milk composition, farmer door



Effect of supplementation on intake of minerals, milk yield and blood biochemical profile in lactating camels under traditional and semi intensive system

N. Saini, N. Singh and B.D. Singh

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Abstract

Assessment of mineral status from feeding trial revealed that straw feeding under traditional system resulted in deficiency of Ca, P, Cu, Zn and Mn. Effect of supplementation of these minerals was evaluated in terms of intake of dry matter, milk yield and body weight as well as on blood biochemical profile in 8 Bikaneri camels. Group 1 camels were managed under traditional system with supplementary feeding of straw at evening. Camels of group 2 were fed same straw with concentrate and mineral mixture under intensive system. Strategic supplementation resulted in significant increase in dry matter ($\text{g/kg}^{0.75}$) intake and consequently higher mineral intake in respective group compared to control. The group 2 camels produced more milk (6.11 litre/day) than group 1 (5.37 litre/day) with an average of 463.63 and 408.34 litres, respectively. The dam of group 1 lost 15 kg body weight while dam of group 2 gained 16.75 kg weight with daily gain of 500 g/day with supplementation and thus indicated positive effect on body weight of dam. Similarly, the calves of supplemented group 2 had significantly faster growth with daily gain of 739.25 g/day than non-supplemented group 1 (631.72 g/day). Average blood minerals concentration was above the critical limit and values of P, Cu, Zn and Mn showed significant increase with supplementation of these minerals. Concentration of total protein was significantly higher in supplemented group (6.69 mg%) compared to control (5.95 mg%). The results indicated that in the existing traditional feeding system supplementation of Ca, P, Cu and Zn are required in diet of lactating camels and dietary supply of these nutrients improved production performance of camel.

Key words: Camels, clusterbean straw, mineral intake, traditional system



Cutaneous alternariosis in dromedary camel

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Abstract

Cutaneous alternariosis is an infectious disease mainly of camel calves of approximately one year of age and the incidence decreases with the advancement of age. Survey in densely camel populated areas revealed that the disease is present in all seasons with increase in rate towards the end of autumn and early winter. The disease occur more frequently in semi arid than arid region of the state. Lesions of the disease are found anywhere on the body including the lips and udder. This disease may be quite confusing with other dermatophyte infections. Repeated culture of skin scrapings lead to isolation of *Alternaria alternata*. As ethnoveterinary treatment either sulphur in mustard oil or leather ash in ghee (butter fat in India) is applied by the farmers. After removal of skin scrapings, topical application of an ointment containing sulphur, salicylic acid and mustard oil gave encouraging results.

Keywords: Alternariosis, camel, cutaneous



Antibacterial activity of aqueous extract of desert plants

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Abstract

Aqueous extract of Pardesi kikar (*Prosopis juliflora*), Jal (*Salvadora oleoides*), Mitha neem (*Murraya koenigii*), Arlu (*Allanthus excelsa*), Shisham (*Dalbergia Sissoo*), Siris (*Albizia lebbek*) were tested for antibacterial sensitivity against 90 isolates of various microorganisms including *Staphylococcus epidermidis* (30), *Staph aureus* (19), *Corynebacterium spp.* (10), *Micrococcus spp.* (10), *Bacillus spp.* (9), *Pseudomonas spp.* (4), *Proteus spp*, *Streptococcus spp.*, *Kiebisella spp*, and *Escherichia coli* (2 each) by the agar gel diffusion method. Overall, maximum sensitivity was exhibited by *Prosopis juliflora* (96.7%) It is concluded *Prosopis juliflora* has a potential, specially in terms of active principles showing antibacterial activity.



Serum progesterone analysis by commercially available EIA kits to monitor ovulation and conception in dromedary camels

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Abstract

Commercially available human Enzyme Immuno Assay (EIA) kit was employed to analyse sequential serum progesterone levels subsequent to 22 matings given to 22 female dromedary camels. The serum progesterone levels at day 7, 9, 15 and 30 *post coitum* was found to be a good indicator of ovulation or its absence. The incidence of non-ovulatory coitus was 40.9% with resultant low (or below detectable limit) progesterone concentrations. The mean serum progesterone concentration of 2.92 ± 1.48 (n=7), 3.55 ± 1.65 (n=3) and 2.41 ± 1.21 (n=3) ng/ml was found at day 7, 9 and 15 post coitum, in ovulatory coitus, respectively. It was concluded that human EIA kits can be used for assay of the progesterone hormone in camels and such an assay can differentiate ovulatory and non-ovulatory coitus in camels.

Keywords: Dromedary camel, enzyme immuno assay (EIA), female, serum progesterone



Zoonotic cases of camel pox infection in India

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Abstract

This study reports the first conclusive evidence of zoonotic camel pox virus (CMLV) infection in humans associated with outbreaks in dromedarian camels (*Camelus dromedarius*) in northwest region of India during 2009. CMLV infection is usually restricted to camels and causes localised skin lesions but occasionally leads to generalised form of disease. However, the present outbreak involved camel handlers and attendants with clinical manifestations such as papules, vesicles, ulceration and finally scabs over fingers and hands. In camels, the pock-like lesions were distributed over the hairless parts of the body. On the basis of clinical and epidemiological features coupled with serological tests and molecular characterization of the causative agent, CMLV zoonosis was confirmed in three human cases. Clinical samples such as skin scabs/swabs and blood collected from affected animals and humans were analysed initially, for the presence of CMLV-specific antigen and antibodies by counter immunoelectrophoresis (CIE); serum neutralization test (SNT); plaque-reduction neutralization test (PRNT) and indirect immunoperoxidase test which was later confirmed by amplification of CMLV-specific ankyrin repeat protein (C18L) gene. Virus isolation was successful only from samples collected from camels. Further. sequence analyses based on three full-length envelope protein genes (A27L, H3L and D8L) revealed 95.2-99.8% and 93.1-99.3% homology with other *Orthopoxviruses* at nucleotide and amino acid levels, respectively. Phylogram of the three genes revealed a close relationship of CMLV with *Variola virus* (VARV). Considering the emerging and re-emerging nature of the virus, its genetic relatedness to VARV, zoonotic potential and productivity losses in camels; the control measures are imperative in curtailing economic and public health impact of the disease. This is the first instance of laboratory confirmed camel pox zoonosis in India.

Key Words: Camel pox virus, zoonosis, orthopoxvirus, camel



Important factors affecting sustainable livelihood of camel dairying in changing scenario of desert ecosystem

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Abstract

The changing scenario of desert ecosystem data were collected meticulously from 141 farmer families of Bikaner district to find out the association of important factors with sustainable livelihood of camel dairying. The households belonged to 14 villages out of which 2 villages were from each of the 7 tehsils, which were predominantly camel rearing regions. Sustainable livelihood encompasses appropriate use of camel as milch animal in changing scenario resulting in generation of adequate income and employment, ensuring food and nutritional security for family, conserving environment, effective input recycling which was ascertained by developing a sustainable livelihood index (SLI). The chi-square analysis of sustainable livelihood of camel dairying (SLCD) with important socio-personnel factors indicated that family size and communication pattern have a significant association with SLCD. The social participation of farmers have significant association with SLCD at 5% level. The analysis of data of important tech-economical variables indicated that market accessibility and land holding were having significant association with SLCD. The camel keeping patterns showed a highly significant association with SLCD. Some factors like farmer's age, education, cropping pattern, and other livestock holding played important role towards camel dairying. Most of farmers were milking their camel through knuckling method and a few practiced hand stripping method. Milking was done in standing position by farmers. Presently, camel milk marketing proceeds entirely in the informal sector but major attraction of camel milk is its lower price at village level but high price at city level, due to imbalance between demand and supply. The need-based training and front-line demonstration of scientific camel dairying to farmers through suitable extension programme would provide impetus to practice profitable camel dairying. It will enhance the household income of camel keepers in changing scenario of desert ecosystem.

Keywords: Camel, dairy farmers, livelihood, sustainability



Mineral status of blood and semen of dromedary camels

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Abstract

This study was carried out on blood serum and seminal plasma samples collected from Jaisalmeri camels to determine the concentrations of minerals in the seminal plasma and their probable role in liquefaction of semen. The concentration of Ca, Zn and Fe were 1, 9, 6, 11 and 20.14 times higher in seminal plasma as compared to blood serum. This study indicated that Ca and Fe might play an important role in coagulation/liquefaction of camel semen. Ca starts to act after 18 h and Fe after 48 h of storage. Interactions between proteins and minerals might be responsible for coagulum formation in camel semen.



Importance of camel milk and production potential of dromedary breeds

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Abstract

The population of the dromedary in the country has gone down from 1.1 m to 0.5 m in last 3 decades. In recent past camel milk has been recognized as a possible tool to sustain the dromedary in situ. In this context this study was carried out in 6 Bikaneri and 4 Kachchhi camels. Two teat milking was followed. The average production from front and rear teats in the morning was 903.81 ± 15.82 and 1113.31 ± 18.40 ml and in the evening was 615.56 ± 14.36 and 776.11 ± 16.76 ml respectively. The average daily milk production pooled over breeds for the initial 16 months was 3606.31 ± 64.59 ml and for rest of the months till 24 month was 2108.64 ± 93.49 ml. The effect of breed was nonsignificant but that of individuals was significant. Out of 10 camels 9 continued till 16 months and the 1 camel, which discontinued giving milk in 14th month, got conceived in the 12th month of lactation. Therefore the lactation in the camels was considered to be of 16 months duration. Accordingly the average lactation yield was 3462 litres. In second phase of lactation about 58% reduction in average daily milk yield was noticed. The average daily milk production was highest in third parity (4847.09 ± 40.24 ml). The peak yield was observed in the third month of lactation. The promotion of camel milk will not only conserve this threatened species of desert ecosystem but also support the life to weaker section of the society.

Keywords: Bikaneri, camel, Kachchhi, lactation, milk, production



Sequence analysis of topoisomerase gene of pseudocowpoxvirus isolates from camels (*Camelus dromedarius*)

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Abstract

Topoisomerase gene of pseudocowpoxvirus from Indian dromedarian camel was amplified by PCR using the primers of PCPV from Finnish reindeer and cloned into pGEM-T for sequence analysis. Analysis of amino acid identity revealed that Indian PCPV of camel shared 95.9–96.8 with PCPV of reindeer, 96.2–96.5 with ORFV and 87.5 with BPSV.

Keywords: Pseudocowpoxvirus, Topoisomerase, PCR, Camel



Cloning and phylogenetic analysis of Interleukin-6 (IL-6) and tumor necrosis factor- α (TNF- α) from Indian dromedaries (*Camelus dromedarius*)

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Abstract

The cDNAs of two proinflammatory cytokines viz., IL-6 and TNF- α from dromedarian camels were amplified by PCR using bactrian camel sequences and subsequently cloned for sequence analysis. Relationship based on amino acid revealed that dromedarian camel IL-6 shared 99.5 % identity both at nucleotide and amino acid level with bactrian camel IL-6 and in case of TNF- α , the identity of dromedarian camel was 99.4 % and 99.1 % at nucleotide and amino acid level, respectively with that of bactrian camel. Phylogenetic analysis based on their amino acid sequences indicated the close relationship in these cytokine genes between dromedarian camel and other members of camelids.



Growth nutrient utilization and serum profile in camel calves as affected by dietary protein levels

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Abstract

Effect of three dietary protein levels on the nutrient utilization, growth performance and serum profile of camel calves was studied for 367 days. Fourteen healthy male camel calves of Bikaneri, Kutchchi and Jaisalmeri breeds (age 15 month; 291.00 ± 7.64 kg b. wt.) were randomly allotted to 3 groups, 5 calves each in group I and II and 4 in group III and fed isocaloric feed blocks containing 9.50, 12.00 and 14.50% CP. The dry matter intake (DMI) was 1.48 ± 0.09 , 1.55 ± 0.02 and 1.38 ± 0.05 Kg/100 kg Bh in groups I, II and III, respectively. Digestibility of DM, OM, EF and CF did not vary significantly among the groups. CP digestibility increased ($P < 0.05$) from group I to groups II and III due to higher dietary protein level. NFE digestibility was decreased ($P < 0.01$) from group I to groups II and III due to change in ratio of energy and protein in the diet. Daily DCP intake/Kg $W^{0.75}$ was similar in groups II and III but significantly ($P < 0.05$) higher than in group I, however, TDN intake was statistically similar among the groups. The average growth rates in groups I, II and III were 0.349 ± 0.02 , 0.381 ± 0.02 and 0.392 ± 0.01 kg/d, respectively. Feed conversion efficiency (Kg DM intake/kg body weight gain) was highest in group III (15.35) followed by group II (15.76) and lowest in group I (16.80), however, variation among groups was not significant. Serum GPT, glucose, total glycerides, cholesterol, total protein, albumin, calcium and phosphorus level did not vary among the groups, however, variation for GOT and chlorides level were significantly ($P < 0.05$). It is concluded that camel calves fed on diet containing 14.04% CP and 63.43% TDN exhibited better growth rate and feed conversion efficiency.

Keywords: Camel calves, nutrient digestibility, feed efficiency, protein levels, serum profile



Phenotypic and genotypic characterisation of Lactobacilli isolated from camel cheese produced in India

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Abstract

Thirty-two Lactobacilli strains were isolated from four samples of camel cheese collected from Bikaner, India. These isolates were identified based on phenotypic and genotypic characteristics. Sequencing of 16S rDNA was performed for species identification and diversity analysis. *Lactobacillus delbrueckii* and *Lb. fermentum* were found to be dominant species followed by *Lb. plantarum* and *Lb. casei*. On evaluation of technological properties of these isolates, 20 isolates were observed to be good acid producers, eight were found positive for citrate utilisation and 11 showed presence of *Prtp* gene. Isolates obtained can be potential for development of defined strain starter for camel cheese.

Keywords: Camel cheese; *Lactobacillus*; 16S rDNA



Molecular diagnosis of *Mycobacterium bovis* as the cause of tuberculosis in a camel

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and K, M. L. Pathak

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Abstract

An adult male camel was diagnosed with tuberculosis (TB). It exhibited typical TB lesions in the lungs, liver and spleen. The histopathological examination of sections of tissues revealed presence of acid-fast bacilli. Mycobacteria were isolated from the camel's lung and were identified as the member of *Mycobacterium tuberculosis* complex (MTBC) subsequently confirmed as *M. bovis* by biochemical tests and multiplex PCR where 445 bp band indicative of MTBC and 823 bp band indicative of *M. bovis* was observed.



Mineral and biochemical status in dromedary female camel

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Abstract

The blood serum macro-micro minerals and biochemical status were monitored in 5 non-conceived and 3 conceived dromedary camels from time of mating to 60 days of post-mating. Camels were maintained ad lib on cluster bean straw, concentrate and mineral mixture in addition to grazing. No significant variation between conceived and non-conceived female was noticed during 60 days post-mating study period except Na and P levels. Serum values of Ca, P and total protein were found lower than normal level. The overall mean values of most of parameters were found comparable in both groups. This study indicated importance of Ca, P and protein supplementation for achieving better fertility.



Effect of herbal immune modulator on growth rate and protein profile of dromedary camel calves during summer stress

D. S. Sena, G. Mal and S.K. Dixit

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Abstract

A clinical trial was conducted to study the effect of herbal immunomodulator during summer stress among 10 camel calves of 5-6 months age divided into two groups equally. The serum immunoglobulin and protein profile was done in both groups i.e., group I (immune modulator fed group) and group II (control group) on different days before the start of experiment (day 0) on day 4 (while feeding) and day 8, 15 and 21 after the completion of feeding. Both the groups were maintained under similar feeding practices. The body weight changes were recorded prior to and after the completion of experiment. The results indicated a significant change ($P < 0.05$) in immunoglobulins, serum protein and globulin of group I in comparison with group II. The mean body weight changes were increased in group I whereas in group II the body weights were slightly decreased. Thus, supplementing herbal immune modulator Restobal augmented the growth rate, prevented the summer stress effect and maintained healthy immune system in camel calves of 5-6 months age.

Keywords: Camel calves, growth rate, immune modulator, summer stress



Oedematous mastitis in camels (*Camelus dromedarius*)

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Abstract

Oedematous mastitis in camels is a managerial problem due to inadequate exercise after calving. This inadequate exercise result in persistent post parturient udder oedema for longer periods and interferes with the normal milk let down and milking process. In some cases, it leads to a chronic oedematous condition of udder with cessation of milk. In very advanced cases, it leads to flabby udder with loosening and wrinkling of udder skin and there is complete stoppage of milk. Examination of 40 clinical oedematous mastitis quarters revealed, infections with major mastitis pathogen i.e. *Staphylococcus aureus*. Most of the fresh calvers were clear from such infection in the apparently healthy animals increase in level of intramammary infections, occurs with the advancement of lactation in vitro antibiotic sensitivity reveled tetracycline the effective drug against majority of the bacterial isolates.

Keywords: Oedematous, mastitis camel, etiology, antibiotic.



Traditional Treatment practices against camel disease in Rajasthan

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Abstract

Survey was carried out in thickly camel populated areas in semi arid climatic conditions (Udaipur and Hanumangarh districts) and in arid climatic conditions (Bikaner and Jaisalmer districts) of Rajasthan state of India, to investigate the ethno veterinary methods practiced by the camel owners for the treatment and control of various ailments affecting camels. During a 3 year period (July 2007- June 2010) a total of 410 camel owners including the persons recommending such practices to them were personally contacted and interviewed. These owners were rearing from a minimum of one camel to a maximum of 160 camels. Information concerning the ethno-veterinary practices for the treatment of common disorders of skin (maggot wound, nasal wound, saddle gall, udder lesion, naval infection, mange, thikria i.e. skin candidiasis and other skin infections), digestive tract (anorexia, indigestion, impaction, colic, constipation, diarrhoea, tympany), musculoskeletal system (rheumatism, muscular weakness, kumree i.e. shivering of hind limbs, enhance healing of fracture and deep wounds) and other routine systemic disorders encountered by the farmers for fever, cough, nasal discharge, pneumonia, haemorrhages, mastitis, actinobacillosis, retention of placenta, helminthiasis, ectoparasites, eye infection, sun stroke, urine prolapse and zeharbad was collected through personal discussions and interviews. Traditional inputs utilised by the camel owners included various plant products, animal products, other natural products and a very few synthetic products. Method of preparation and applications of traditional drugs varied as per the ailment to be treated. Firing remained the last resort by the camel owner, if the animal did not respond to any kind of treatment. Preventive practices adopted by the camel owners included; breeding studs were given red alum, jaggery and mustard oil during breeding season to avoid fatigue and increase libido. Exercise in fresh lactating camels to avoid mastitis and smoke in the sitting area to avoid insect and flies. This traditional knowledge was collated with scientifically validated knowledge concerning any ingredients or active constituents of the ingredients. This collation revealed scientific relevance behind many traditional practices. Predominance of use of a particular therapy varied mainly as per the availability of the product in a particular area. Frequency of use can be correlated with either the effectiveness of a particular therapy or effective transmission of therapeutic knowledge among the farmers.

Key words: Camel, disease, ethno-veterinary, prevention, Rajasthan rangeland, treatment



Biochemical and trace mineral profile in post parturient dromedary camel (*Camelus dromedarius*)

S. Vyas, N. Sani, B. D. Kiradoo, A. Lukha, N. Kishore, G. Mal and
K. M. L. Pathak

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Abstract

The present study was conducted to evaluate the biochemical and trace mineral profile in post parturient dromedary camel. The serum iron (Fe), zinc (Zn), copper (Cu), manganese (Mn), magnesium (Mg), calcium (Ca), phosphorus (P), total protein (TP) and cholesterol were 35.95 ± 1.49 $\mu\text{g/ml}$, 185 ± 18.6 $\mu\text{g/dl}$, 96.66 ± 3.0 $\mu\text{g/dl}$, 90.37 ± 2.1 $\mu\text{g/dl}$, 3.45 ± 0.05 mg/dl , 9.64 ± 0.22 mg/dl , 3.13 ± 0.24 mg/dl , 5.63 ± 0.18 g/dl and 52.59 ± 4.81 mg/dl respectively. No significant difference was found in serum iron, zinc, copper, manganese, magnesium, calcium, phosphorus, total protein and cholesterol content between camels conceived and not conceived from breeding in early post-partum period. The Ca: P ratio was wider in non-pregnant (3.3: 1) than pregnant camels (2.5: 1).

Keywords: *Camelus dromedarius*, trace mineral, post-parturient female



Efficacy of buserelin to induce ovulation in camels

S. Vyas

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Abstract

Ovaries of 4 adult non-lactating, non-pregnant one humped female camel (*Camelus dromedarius*) belonging to the herd of National Research Centre on Camel, Bikaner, India, were examined using real-time ultrasonography for the presence of follicle with ≥ 1.0 cm diameter. Buserelin acetate 40 μg i.v. was used to induce ovulation. Sequential ultrasound examination at 24, 36, 48, 60, 72, 84 and 96h of the Buserelin administration revealed that ovulation did not occur up to 96 h in all four female camels.

Keywords: Camel, ovulation, ultrasound



On farm testing of camel management practices in changing agro – ecological scenario

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Abstract

In a feeding management experiment eight camel calves were allotted randomly into two equal groups and reared under stall feeding management condition (group-I) and under stall feeding along with grazing management practices (group-II) for a period of 173 days. The average growth rate, body weight and morpho-metric parameters viz: body length, heart girth, height at wither, neck length, and leg length (fore & hind) were significantly ($P<0.01$) higher in group-II animals as compared to group-I. The horizontal hump circumference was found to be similar but vertical the hump circumference varied significantly ($P<0.05$) between two groups. The ethological aspect of feeding behaviour indicated the order of feeding behavioural preference was for Khejri (*Prosopis cineraria*) followed by Phog (*Calligonum polygonoides*) and Ganthia (*Dactyloctenium aegyptium*) among trees, bushes and grasses, respectively. Overall better performance of group-II was due to higher plane of nutrition as compared to group-I. The levels of glucose, total protein and globulin were significantly ($P<0.05$) higher in group II also indicated better management practices in group-II as compared to group-I. Similarly the average levels of serum calcium, phosphorus, zinc and iron as well as levels of hair minerals like sulphur, calcium, zinc and iron were also significantly ($P<0.05$) higher in group- II than group-I. The total feeding cost per calf was higher in group-I as compared to group-II and due to it the cost involved for one kg body weight gain was quite less and economical in group-II than group-I. Thus the practice of stall feeding along with grazing management found to be better as compared to stall feeding alone for camel calf rearing.

Keywords: Behaviour, bio-chemical, camel, economics, farmers, mineral, performance



Influence of practice on performance of camel in various rearing condition of an organized farm

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Abstract

The different rearing practice was provided to 18 camel calves of NRCC in 2 group for 180 days. First group was reared under intensive condition (RIC) and second group was reared under semi-intensive condition (RSIC). The average growth rate and body weight were significantly increased in RSIC as compared to RIC group at the end of experiment. The average total gain was higher in RSIC than RIC group. The feed conversion efficiency was 12.86 ± 0.71 . Morphometric parameters, viz. body length, heart girth, height at wither, neck length, hump circumference (horizontal) and leg length (fore and hind) were significantly increased in RSIC as compared to RIC group. The hump circumference (vertical), foot pad length (fore) and width (hind) were varied significantly between groups of rearing practices. The availability and intake of higher plane of nutrients could be attributed to overall better performance of RSIC as compared to RIC group. The average levels of serum calcium, phosphorus, zinc and manganese were significantly increased in RSIC than RIC group. The average levels of serum magnesium, copper and iron were high in RISC as compared to RIC group. The levels of total protein, globulin, glucose significantly varied between 2 groups of rearing practices. The increased levels of total protein, globulin and glucose indicate that rearing practices in RISC fared better as compared to RIC group. The total feeding cost per calf for 180 days and for whole group were high in RIC as compared to RSIC. The cost invested for 1 kg body weight gain was quite less and economical in RSIC than RIC group. It was concluded that the practice for camel calf rearing in the semi- intensive condition was better as compared to practice in the intensive condition.

Keywords: Biochemical, camel, economics, mineral performance



Sonographic monitoring of early follicle growth induced by melatonin implants in camels and the subsequent fertility

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Abstract

The present study examined the effect of melatonin implants on follicle growth in dromedary camels two months ahead of their natural breeding season (December to March). Female camels (n = 6) were treated with melatonin implants at the dose rate of 1 implant, per 28 kg body weight sc. Control camels (n = 6) were administered an SC placebo implant of 8 ml vitamin A. Ovarian ultrasonography was performed at weekly interval upto 7 weeks. Camels were mated with virile stud when a follicle (≥ 10 mm) was visible on either of the ovaries. Blood was collected on day 7, 9, 15, 20, 25 and 30 for assay of plasma progesterone and sonography performed at the same time. Small follicles (2-3 mm) appeared around the periphery of ovaries in 83.3% of camels by day 7 and in 100% camels by day 14. By the end of 7th week an ovulatory size follicle (≥ 1.0 cm) could be observed in 83.3% of treated camels, and these camels were mated with virile studs. In control group, small follicles appeared at the periphery of ovaries only in 66.6% camels but did not progress in growth except in one camel (16.6%) however, ovulating size (≥ 10 mm) follicle was not observed in any camel by the end of 7th week. All treated camels ovulated and one treated camel became pregnant while early embryonic death occurred in one camel. Non-pregnant camels of both groups were mated during the breeding season. All camels of treatment group and 33.33% camels of control group became pregnant by the end of breeding season (April 2010). It was concluded that melatonin implants can augment the follicle growth in lactating camels ahead of the breeding season and pregnancy can occur on mating. Fertility of treated camels during the breeding season is improved.

Keywords: Camel, melatonin, implant, progesterone, ovary, ultrasound



Mortality analysis and herd growth in Indian dromedary breeds

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Abstract

Records belonging to 1024 dromedary over a span of about 22 years managed at the centre were analysed to envisage the major threats during different stages of life in different breeds and sexes. Analyses revealed that differential breed mortality had occurred ($X^2 = 19.594$, $P < 0.01$). No preferential sex mortality was observed ($X^2 = 0.8767$, $P > 0.05$). Chi-square variance test indicated highly significant effect ($X^2 = 39.4574$, $P < 0.01$) of age group on mortality. The mortality was maximum in adults above 3 years of age (0.2029) followed by 0-1 year (0.1943) and 1-3 years age group (0.0875). Of the total camels died, 38.4% died in the first year of their life followed by 13.8% in 2nd Year, 5.5, 5.5 and 5.2%, respectively in the 3rd to 5th year. Of the camels that succumb to death in the first year, 49.5% died in the first month of their life followed by 15.3% in the 2nd month, 11.7% in the 3rd month. The major threats during first year of life were identified as pneumonia, heat stroke and enteritis. The mortality due to different systems differed significantly ($X^2 = 318.35$, $P < 0.01$). Maximum mortality (41.39%) was due to the involvement of digestive system followed by respiratory system (22.36%). The average annual herd growth was 8.53%. The standard death rate in the four genotypes viz. Bikaneri, Jaisalmeri, Kachchhi and Arab-cross was 4.80, 3.01, 3.63 and 10.49%, respectively. Scientifically planned breeding and improved health management would improve the situation and increase productivity.

Keywords: Analysis, camel dromedary, herd growth, mortality



Cloning and sequence analysis of IL-2, IL-4 and IFN- γ from Indian Dromedary camels(*Camelus dromedarius*)

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Abstract

The cDNAs of three cytokines, viz., IL-2, IL-4 and IFN- γ from Dromedary camels were amplified by PCR using Bactrian camel sequences and subsequently cloned for sequence analysis. Relationship based on amino acid sequences revealed that Dromedary camel IL-2 shared 99.5% and 99.3% identity at the nucleotide and amino acid levels with Bactrian camel IL-2. In the case of IL-4, the identity of Dromedary camel was 99.7% and 99.2% at the nucleotide and amino acid levels, respectively with that of Bactrian camel. The Dromedary camel IFN- γ shared 100% identity both at nucleotide and amino acid levels with Bactrian camel IFN- γ . Phylogenetic analysis based on amino acid sequences indicated the close relationship in these cytokine genes between the Dromedary camel and other camelids.

Key words: Dromedary camel, cytokine genes, phylogenetic analysis



Voluntary feed intake, serum profile, growth performance and economics of weaned camel calves

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Abstract

Six camel calves (3) Jaisalmeri and 3 Kutchchi) were weaned at 4.5 months of age. The calves had average body weight of 132.4 kg at 4.5 months of age and were raised on dry chaffed *Cyamopsis tetragonoloba adlib* and weighed quantity of *Cynodon dactylon* grass and concentrate mixture till 9 months of age. Average voluntary dry matter intake was 3.60 kg/d or 2.31 kg/100kg DMI. Significant ($P<0.05$) lower serum total protein, urea and triglycerides levels but higher levels of phosphorus and chloride at 6th month of age than at 9th month of age were observed. The calves gained 56 kg over 139 days or 402.83 g/d with feed efficiency (DMI kg/kg body weight gain) of 8.78. The results indicated that weaning was more economical and resulted in saving of Rs. 10162.06.

Keywords: Blood parameters, camel calves, economics, feed efficiency, weaning



Performance of lactating dromedary camels maintained on different energy rations under arid ecosystem

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Abstract

In a lactation trial of 194 days, 10 Jaisalmeri breed camels aged 10-20 years having body weights of 607.90 ± 24.63 kg in their 2-4 parity were fed on iso-nitrogenous (12%) complete feed blocks having 50 (G1), 55 (G2) and 60% (G3) levels. Milk yield of group G1 was minimum 7.69 litres per day and it was maximum of 8.44 litres/d in group G3 indicating positive effect of higher dietary energy level. During the experimental period group G1 lactating camels lost their body weights (49 kg or -256.54 g/ d), group G2 camels maintained whereas the lactating camels of group G3 lost marginally (-5.75 kg or -29.64 g/ d) live weights. The dry matter intake (DMI) kg/d or kg/100 kg body weight was 9.77 ± 0.07 or 1.72 ± 0.03 in group G1 and 9.84 ± 0.12 or 1.65 ± 0.04 in group G2 which were statistically similar but significantly ($P < 0.5$) increased to 11.57 ± 0.81 or 1.99 ± 0.08 in group G3, respectively. Digestibility coefficients of OM and NFE proximate principles differed significantly ($P < 0.05$) among three groups which increased from group G1 to group G3. The digestibility of DM, CP, EE and CF was similar among group G1 and G2 but was significantly ($P < 0.05$) different and lower than that in group G3. The daily intake of DCP (g), TDN (g) and ME (MJ) /kg metabolic body weight was significantly ($P < 0.05$) different among 3 groups and increased from group G1 to G3 with increase in dietary energy level. The daily intake of DCP (g), TDN (g) and ME (MJ) /kg metabolic body weight was 5.07 ± 0.07 , 43.19 ± 0.53 and 0.65 ± 0.01 in group G1; 5.32 ± 0.13 , 44.19 ± 1.12 , 0.67 ± 0.02 in group G2 and 6.79 ± 0.03 , 60.32 ± 1.53 and 0.91 ± 0.03 in group G3, respectively. It was inferred that lactating camels of group G3 given complete feed block containing 6.97% DCP and 107.21 ME MJ performed better in terms of milk yield, body weight maintenance and nutrient utilisation.

Key words: Body weight changes, camel, digestibility, milk yield, nutrient intake



Use of collagenase type-1 to improve the seminal characteristics of dromedary camel semen

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Abstract

In this study a total of forty semen ejaculates were collected during the breeding season from eight different stud camels using artificial vagina. All ejaculates were spilt into 3 equal parts of aliquots. One aliquots was kept as control (A1) and two of these were diluted with tris buffer media in 1:1 with (A3) or without (A2) addition of 0.1 % collagenase type-I enzyme and evaluated for macroscopic and microscopic semen characteristics after being kept at room temperature for 20 min. All aliquots were pipetted to observe the macroscopic examination (Consistency and rheological (Thread formation) properties). Aliquot (A3) did not form thread when pipetted and showed thin watery consistency while the other two aliquots (A1 and A2) did evidence thick viscid, thick and thin watery consistency in different proportions. Only aliquot (A3) showed initial individual sperm motility and functional activity (HOST) curled tailed spermatozoa with overall average over 70%. There were significant differences ($p < 0.01$) between all the aliquots for sperm motility and sperm with functional membrane where as non-significant differences ($p > 0.01$) were observed between all the aliquots for live spermatozoa and sperm abnormalities percentage. An overall mean of sperm concentration in the camel semen treated with collagenase enzyme was $3.31.75 \pm 13.17$ million/ml. The results showed that treating semen with 0.1% collagenase in tris buffer media improves semen macroscopic and microscopic characteristic and also facilitates the separation of spermatozoa from seminal plasma in dromedary camel semen.

Keywords: Camel, semen, collagenase type-1, tris buffer



Induction of lactation in agalactic camel using different drug

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Abstract

Sixty six she camel calved during the year spread between October to February with very good body weight and body condition score (BCS) of she camel and birth weight of calves. Out of these sixty six animals calved nineteen animals were agalactic. These animals belong to different breeds. (Kachchi=3. Bikaneri=7, Jaisalmeri=2 and Mewari=7). Initially all these animals were taken into one group (Group I) to administer liquid ostovet orally. Subsequently the same were divided into two groups(Group II and Group III) to administer Agrimin forte Powder plus Galactin to Group II and Agrimin forte plus Galactin plus Nausdin and injection Eminorm to Group III. No change of fodder was done during the period of experiment. Just after one month all the agalactic animals initiated lactation and those who were induced lactation earlier were continuing lactation and producing milk sufficient to meet the demand of their calf.

Keywords: Lactation, agalactia, camel, domperidone



Skin candidiasis (Thikria) in dromedary calves

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Abstract

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

Keywords: Camel, mustard oil, Potassium iodide, salicylic acid, skin candidiasis, sulphur, treatment



Mortality of a neonatal camel calf due to paecilomycosis infection of the lungs

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Abstract

A male calf of Jaisalmeri breed was born to a completely agalactic dam. Since calf could not get colostrum, so the camel milk feeding through nipple bottle was started on day first, as a usual practice adopted for such calves on the farm. On the 3rd day calf stopped feeding and suffered with respiratory insufficiency with deep laboured respirations along with abdominal movements and fever of 103°F. The calf was treated with antibiotics, analgesics, corticosteroids and fluid therapy but the calf died on 6th day. Post-mortem examination revealed that whole of the lung was black in colour with papules and patchy fibrinous deposit on the surface along with emphysema. Mycological examination revealed for the isolation and identification of *Paecilomyces lilacinus*.

Keywords: Camel, paecilomycosis, lung infection



Oestrus pheromones in farm mammals, with special reference to cow

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Abstract

Pheromones are defined as chemical signals that are released from one individual and induce specific endocrine or behavioural reactions in another individual of the same species. Odours play a significant role in signalling the stage of reproduction of the cow, and the bull can use a combination of factors displayed by the female to determine its receptivity. During oestrus, females release olfactory molecules, thus signalling the stage of their cycle and stimulating sexual behaviour and functions of males. Attempts were made to review the chemical nature of olfactory signals of oestrus in milk, urine, blood, saliva, skin gland secretion during the prooestrous and oestrous cycle. Several behavioural studies indicated that bovine milk from different stages of the oestrous cycle had different odours. Bulls have also been found to detect pheromone odours and differentiate between oestrus and non-oestrus urine. Bioassay involving rats revealed the presence of maximal pheromone activity during prooestrus. Vaginal fluid is also reported to act as a chemical signal. Saliva, serum, skin gland secretions and faeces have also been studied for their pheromonal properties. Systemic evaluation of either urine or vaginal secretions over the whole cycle has yet to be investigated. The use of artificial olfaction could enable more accurate detection of oestrus and potentially increase fertility in cows. The current status of chemical signals (pheromones) of oestrus and their identification in farm animals is reviewed in this article with emphasis on cows.

Keywords: Cattle, farm animals, oestrus, pheromone



Molecular analysis of the bacterial microbiome in the forestomach fluid from the dromedary camel (*Camelus dromedarius*)

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Abstract

Rumen microorganisms play an important role in ruminant digestion and absorption of nutrients and have great potential applications in the field of rumen adjusting, food fermentation and biomass utilization etc. In order to investigate the composition of microorganisms in the rumen of camel (*Camelus dromedarius*), this study delves in the microbial diversity by culture-independent approach. It includes comparison of rumen samples investigated in the present study to other currently available metagenomes to reveal potential differences in rumen microbial systems. Pyrosequencing based metagenomics was applied to analyze phylogenetic and metabolic profiles by MG-RAST, a web based tool. Pyrosequencing of camel rumen sample yielded 8,979,755 nucleotides assembled to 41,905 sequence reads with an average read length of 214 nucleotides. Taxonomic analysis of metagenomic reads indicated Bacteroidetes (55.5 %), Firmicutes (22.7 %) and Proteobacteria (9.2 %) phyla as predominant camel rumen taxa. At a finer phylogenetic resolution, *Bacteroides* species dominated the camel rumen metagenome. Functional analysis revealed that clustering-based subsystem and carbohydrate metabolism were the most abundant SEED subsystem representing 17 and 13 % of camel metagenome, respectively. A high taxonomic and functional similarity of camel rumen was found with the cow metagenome which is not surprising given the fact that both are mammalian herbivores with similar digestive tract structures and functions. Combined pyrosequencing approach and subsystems-based annotations available in the SEED database allowed us access to understand the metabolic potential of these microbiomes. Altogether, these data suggest that agricultural and animal husbandry practices can impose significant selective pressures on the rumen microbiota regardless of rumen type. The present study provides a baseline for understanding the complexity of camel rumen microbial ecology while also highlighting striking similarities and differences when compared to other animal gastrointestinal environments.

Keywords: Metagenomes, pyrosequencing, MG-RAST Seed subsystem, *Bacteroides* and camel



Amplification, cloning and sequence analysis of paraflagellar rod 2 gene of *Trypanosoma evansi* isolated from Indian dromedaries

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Abstract

The present study was carried out to amplify the Paraflagellar Rod 2 gene of *Trypanosoma evansi* from camel by polymerase chain reaction, clone the amplicon in a suitable plasmid vector and characterization of pfr2 gene through sequencing. The desired amplicon of pfr2 gene of *Trypanosoma evansi* was amplified by PCR using gene specific primers and identified on the basis of size of the pfr2 gene. The amplicon of expected size was purified from the 1% low melting agarose gel. DNA fragment of interest was then ligated to the pGEM- T Easy vector and ligated mixture was transformed into *Escherichia coli* JM109 strains for cloning. After cloning, screening of recombinants was done by Restriction Enzyme digestion of plasmid DNA and by Colony PCR for quick screening of plasmid insert directly from *E. coli* colonies in the presence of insert specific primers. After confirmation of clone of pfr2 genes the plasmid DNA was sequenced and coding sequences of pfr2 gene according to the result obtained was of 1767 bp. Tree topology of pfr2 gene is based on the Neighbor-Joining method with 100% bootstrap values and identified pfr2 gene sequence showed a close homology with other *Trypanosoma* and *Leishmania spp.* gene sequences.

Keywords: *Trypanosoma evansi*, camel, Paraflagellar Rod 2 gene, cloning, sequencing



Molecular Characterisation of paraflagellar rod 1 gene of *Trypanosoma evansi* isolated from Indian dromedaries

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Abstract

The study was conducted for characterisation of Paraflagellar Rod 1 (*pfr1*) gene of *Trypanosoma evansi* from camel at molecular level. Genomic DNA of *T. evansi* from camel was used to amplify the *pfr1* gene by polymerase chain reaction. Cloning of the amplicon was done in a suitable bacterial plasmid vector and characterisation of *pfr1* gene was carried out through sequencing. The desired amplicon of *pfr1* gene of *T. evansi* was amplified by PCR using gene specific primers and identified on the basis of size of the *pfr1* gene. The amplicon of expected size was purified from the 1% low melting agarose gel. DNA fragment of interest was then ligated to the pGEM- T Easy vector and ligated mixture was transformed into *Escherichia coli* JM109 strains for cloning. Screening of recombinants was done by restriction enzyme digestion of plasmid DNA and by colony PCR for quick screening of plasmid insert directly from *E. coli* colonies in the presence of insert specific primers. After confirmation of clone of *pfr1* genes the plasmid DNA was sequenced and coding sequences of *pfr1* gene according to the result obtained was of 1769 bp. Tree topology of *pfr1* gene is based on the Neighbor-Joining method and maximum parsimony method with 100% bootstrap values and identified *pfr1* gene sequence showed a close homology with other *Trypanosoma* and *Leishmania* spp. gene sequences.

Keywords: Camel, cloning, India, paraflagellar Rod 1 gene, sequencing, *Trypanosoma evansi*



Molecular characterisation of Mewari breed of camel

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Abstract

Forty one microsatellite loci were investigated for studying the genetic polymorphism in Mewari breed of camel. Polymerase chain reactions were carried out for 50 unrelated camels of Mewari breed. The amplification products were resolved in 6% (denaturing) urea PAGE and stained with silver nitrate. Out of forty one microsatellite loci twenty one were polymorphic in Mewari camels. The number of alleles ranged from 2 to 5. The observed and expected heterozygosity ranged from 0.14 to 0.83 and 0.264 to 0.720. The polymorphic information content of the markers ranged from 0.244 to 0.649. The results indicated existence of selective breeding in the Mewari breed; nevertheless, there exists enough genetic variation among Mewari camels. Hence, the studied microsatellite markers can potentially be used for diverse genetic applications including linkage mapping, marker assisted selection for production enhancement, individual identification and parentage testing.

Keywords: Camel, dromedary, characterisation, Mewari, microsatellite



Comparison of virokinine from camel pseudocowpoxvirus (PCPV) with Interleukin 10 of the Dromedary camel (*Camelus dromedarius*)

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Abstract

Cellular interleukin-10 (IL-10) gene from the peripheral blood mononuclear cells of the healthy Dromedary camel (*Camelus dromedarius*) and viral IL-10 (vIL-10) from the skin scabs of the Dromedary camels infected with contagious ecthyma (a parapoxviral infection in the camels) were amplified by polymerase chain reaction, cloned and characterized. Sequence analysis revealed that the open reading frame (ORF) of dromedarian camel IL-10 is 537 bp in length, encoding 178 amino acid polypeptide while open reading frame of vIL-10 from camel is 561 bp, encoding 187 amino acid polypeptide. The Dromedary camel IL-10 exhibited 62.6% and 68.5% sequence identity at the nucleotide and amino acid level, respectively, with vIL-10 from camel. Sequence analysis also revealed that the Dromedary camel IL-10 shared 99.4% and 98.3% identity at the nucleotide and amino acid level, respectively, with the Bactrian camel (*Camelus bactrianus*). But vIL-10 from camel shared 84.7% and 83.4% sequence identity at the nucleotide and amino acid level, respectively, with vIL-10 from reindeer (*Rangifer tarandus*), which is a ruminant species belonging to the order Artiodactyla. The present study was conducted to evaluate the evolutionary origin of the camel parapoxvirus with parapoxviruses of cattle and sheep and the resultant sequence analysis revealed that camel parapoxvirus is closely related to cattle parapoxvirus than sheep parapoxvirus (Orf' virus).

Keywords: The Dromedary camel Pseudocowpox virus, Interleukin-10 Contagious ecthyma



Phylogenetic analysis of immunomodulatory protein genes of camelpoxvirus obtained from India

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Abstract

The haemagglutinin (HA) encoding gene and genes encoding for immunomodulatory proteins i.e., schlafen-like protein, epidermal growth factor and golgi anti apoptotic protein of camelpoxvirus (CMLV) obtained from Indian dromedarian camels were cloned and characterized. In this study, the size of the HA encoding gene obtained from the Indian CMLV is 941 bp which is only partial. Sequence analysis of schlafen-like protein gene revealed that CMLV obtained from India shared 99.6% identity with CMLV-Iran and CMLV-Kazakhstan strains both at nucleotide and amino acid level. The size of epidermal growth factor (EGF) gene of Indian CMLV obtained in this study was 418 bp, which was due to the addition of one cytosine residue position 132 of EGF gene of Indian CMLV. Sequence analysis revealed that the Golgi anti-apoptotic protein (GAAP) of Indian CMLV shared 99.5% sequence identity both at the nucleotide and amino acid level with CMLV-Kazakhstan. Based on the nucleotide and amino acid sequence identities and phylogenetic analyses of these genes, it is found that CMLV-India is forming a cluster with Kazakhstan and Iranian CMLV isolates.

Keywords: camelpoxvirus, Haemagglutinin encoding gene, Immunomodulatory protein genes, Phylogenetic analysis, India



Nutrient utilization and serum biochemical profile of adult dromedary camels fed oat straw and groundnut haulms

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Abstract

The study was conducted to explore the feasibility of incorporation of oat straw in the diet of camels. Five adult male camels (726.00 kg B.Wt, 8-10 years) were fed sole roughage diet of dry chaffed oat (*Avena sativa*) straw in phase I to estimate its nutritional worth followed by feeding of oat straw and groundnut (*Arachis hypogea*) haulms in 1:1 ratio in second phase II to study the impact on nutrient digestibility and intake. In phase III, the camels were switched to sole roughage ration of groundnut haulms. Average DM intake kg/ d or DMI kg/ 100 kg body weight was minimum (3.83 or 0.54) in camels fed sole oat straw ration which improved ($P<0.05$) on supplementation in second phase (6.80 or 0.98) and was maximum in third phase (8.70 or 1.20) in camels given only groundnut haulms, The digestibility of DM, OM, CP was similar in phase II and III but significantly ($P<0.01$) higher than in phase I. Because of supplementation effect of better nutritional valued groundnut haulms, the intake of DM, DCP and ME increased significantly ($P<0.01$) from phase I to phase III. Similar serum glucose, total protein in 3 phases but higher serum urea level ($P<0.01$) was observed in phase I followed by phase II and lower in phase III. The results indicated poor nutritional value of oat straw and the need of its pre-treatment to increase its digestibility for incorporation in the animal diet

Keywords: Groundnut haulms, male camels, nutritional value, oat straw, serum biochemicals



Evaluation of roughage based complete feed pellet diets in male camel calves

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Abstract

Effect of roughage based complete feed pellet diets on nutrient utilization, growth performance and serum profile of camel calves was studied. Duration was 213 days. Twelve healthy male camel calves of Bikaneri and Kutchchi (age 2.5 months; 430 kg body weight), randomly allotted to 3 groups, 4 calves in each group were fed complete feed pellets containing crude protein and total digestible nutrients of 9.94 and 63.35 (A); 12.24 and 62.62 (B) ; and 15.44 and 58.95(C) per cent respectively. Camel calves of group A recorded significantly ($P<0.01$) higher' body weight gain (0.687kg/d) as compared to group B (0.493kg/d) and C (0.410kg/d). Feed efficiency in terms of DMI kg/kg live weight gain was observed to be significantly ($P<0.01$) different among 3 groups. It was maximum in camel calves of group A (10.80) followed by B camel calves (13.91) and minimum in C (16.53). Although feed cost (Rs./q) was higher in A (686.00) but due to higher growth, the feed cost in rupees per kg live weight gain was the lowest in A (80.13) and highest in C (115.95). No significant variation was observed for digestibility coefficients of DM, OM, EE, CF, NDF and ADF but digestibility coefficient of CP and NFE showed significant ($P<0.05$) difference among the groups. While CP digestibility increased significantly ($P<0.05$) from A to B and C, no significant difference was observed between B and C. The NFE digestibility showed significant ($P<0.05$) fall from A to C but difference between A and B was non-significant. The daily intake of DCP (g /kg metabolic body weight) increased significantly ($P<0.05$) from group A to C whereas DM and TDN intake was statistically similar among 3 groups. There was no significant difference among 3 groups for serum, glucose, total protein, albumin, but serum urea differed significantly ($P<0.05$). The results revealed that camel calves can be fed on diet containing 9.94 %crude protein and 63.35% TDN with 50:50 roughage to concentrate ratio for better growth rate and feed conversion efficiency.

Keywords: Blood profile, camel calves, digestibility, economics, feed pellets, feed efficiency, nutrient intake



Chronological classification of pathomorphological lesions in dromedary contagious ecthyma infection

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Abstract

An outbreak of camel contagious ecthyma (CCE) occurred in a camel herd of the National Research Centre on Camel, Bikaner, India. The pathomorphological lesions of CCE were classified into 5 different stages on the basis of their sequence of occurrence, nature and duration. In the initial stage, development of erythema and papules which lasted for 1 week, were observed. This was followed by a facial swelling stage which remained for another 1 week, in which swelling on face due to enlargement of mandibular and cervical lymph nodes was observed. In the pustular stage, swelling was subsided and pustules developed on lips, nose, face, eyes and neck region. This stage lasted for 4-5 weeks. In the scab stage, the pustular lesions dried and remained as scab for 1-2 weeks. In the recovery stage, the scab lesions started detaching with formation of grey spots at the affected areas. This stage lasted for 1-2 weeks followed by complete recovery. Histopathology of pustular and scab lesions revealed hydropic degeneration of keratinocytes, hyperplasia of epidermis, hyperkeratosis and intraepidermal pustule with mononuclear cellular infiltration. Intracytoplasmic eosinophilic inclusion bodies were observed in keratinocytes in the epidermis. The total course of the disease in individual camel varied from 8 to 11 weeks. This is the first report on sequential classification of pathomorphological lesions of CCE.

Keywords: Camels contagious ecthyma, histopathology, lesion classification, pathomorphology



Identification and molecular cloning of RoTat VSG gene of *Trypanosoma evansi* of camel in India

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Abstract

The present study was carried out to isolate the Rode Trypanozoon Antigen Type VSG (*RoTat* VSG) gene of *Trypanosoma evansi* using PCR and cloning of the gene. The desired amplicons of *RoTat* VSG gene from genome DNA of *T. evansi* was successfully amplified by PCR using gene specific primers. Amplified PCR product was identified on the basis of size of the *RoTat* VSG gene using 25mM MgCl₂ and at annealing temperature of 51°C. For cloning the purified DNA fragment was ligated to the pGEM- T Easy vector and ligated mixture was transformed into *Escherichia coli* JM109 strains. The cells containing recombinant plasmid was identified on the basis of white/blue colony selection on LB agar containing X-Gal, IPTG and ampicillin. Screening of recombinant was done by Restriction Enzyme digestion of plasmid DNAs using *EcoRI* and confirmed on the basis of gene size, i. e 1450 bp for *RoTat* VSG gene. Colony PCR was done for quick screening of plasmid inserts directly from *E. coli* colonies in the presence of insert specific primers.

Keywords: Camel, cloning, *RoTat* VSG, *Trypanosoma evansi*



Micro minerals profile of commonly used feeds and forages of camel in transitional plains of inland drainage (Rj- 3) of Rajasthan

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Abstract

Mineral content of common feeds and fodders under existing feeding practices in transitional plain of inland drainage (RJ- 3) of Rajasthan have been evaluated that are fed and browsed by camel to fulfill the trace mineral requirement. Iron and Manganese were found non-limiting. Copper content of straws were towards marginal side (9.79 ± 0.41 ppm). Tree leaves were good source of Cu (15.76 ± 0.99 ppm) whereas pasture grasses in the community grazing land contained adequate level of Cu. Zinc levels ranges from 14.00 ± 4.00 to 40.86 ± 6.25 ppm. Deficiency of Zn was observed in most of the basal fodders, tree leaves and concentrate ingredients of camel under all prevalent feeding practices. Iron content of all feedstuffs was found to be reasonably higher than the critical levels (361.21 ± 27.06 to 782.72 ± 23.73 ppm) in all feeds and fodders being fed to camel. Mn content was above the critical level in all these crop residues (55.29 ± 1.95 ppm) except guar straw.

Keywords: Micro minerals, camels, plain of Rajasthan



Prediction equation for estimating live body weight of dromedary calves

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Abstract

Prediction of live body weight of dromedary calves was attempted through regression models utilising the body dimensions viz. body length, heart girth and height at withers. A total of 46 neonatal dromedary calves of 4 dromedary genotypes comprising 30 males and 16 females were measured up to 14 weeks of age. The breed and sex associated differences were non-significant ($P>0.05$). Eleven regression models viz., linear, logarithmic, inverse, quadratic, cubic, compound, power, S, growth, exponential and logistic and the three body dimensions were utilised. Heart girth appeared as the most reliable predictor of the body weight at this stage of life. The power regression equation gave the best fit ($R^2 = 0.92$) for the unique measurement of heart girth. Efforts were also made to derive the coefficients utilising the mean values and it was observed that most of the regression models explained the variability to the extent of $\geq 99\%$. The quadratic equation $Y = 18.9162 - 0.6845 HG + 0.011645 HG^2$ and power equation $Y = 0.0008684 (HG^{2.44333})$ explained the variability to the extent of 99.7% and may be used for the precise estimation of body weight during early months of the life. However, looking at the requirement of estimation of unique live weight, it is recommended that the power equation $Y = 0.0008684 (HG^{2.44333})$ may be used as the most reliable one by the scientists, veterinarians and animal husbandry men for all practical purposes.

Keywords: Body weight, camel, mathematical functions



Amplification, cloning and sequence analysis of alternative oxidase gene of *Trypanosoma evansi* isolated from Indian dromedarius

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Abstract

The present study was carried out to isolate the Alternative oxidase (*aox*) gene of *Trypanosoma evansi* by polymerase chain reaction, clone the amplicons in a suitable bacterial plasmid vector and characterisation of the gene through sequencing. The desired amplicon of *aox* gene of *T. evansi* was amplified by PCR using gene specific primers and identified on the basis of size of the gene. The amplicon of expected size was purified from the 1% low melting agarose gel. The DNA fragment of interest was then ligated to the pGEM- T Easy vector and ligated mixture was transformed into *Escherichia coli* JM109 strains for cloning. After cloning, screening of recombinants was done by Restriction Enzyme digestion of plasmid DNA and by colony PCR. After confirmation of clone, the plasmid DNA was sequenced and coding sequence of *aox* gene according to the results obtained was of 990 bp. Tree topology of *aox* gene is based on the Neighbor-Joining method with 100% bootstrap values and identified *aox* gene sequence showed a close homology with other *Trypanosoma* spp. gene sequences.

Keywords: Alternative oxidase gene, camel, cloning, sequence analysis, *Trypanosoma evansi*



Effect of draughting work on certain physiological, haemato-biochemical and enzymatic parameters of dromedary camels

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Abstract

To evaluate the effect of draughting work on physiological, haemato-biochemical and enzymatic parameters, a study was executed with nine camels engaged in ploughing work at district Jhunjhunu (Raj). Samples were collected just prior to commence the work early in the morning time and after completion of the work in evening. All the physiological parameters viz. pulse rate, respiratory rate and temperature were significantly ($P < 0.001$) higher in camels after work. Regarding haematological studies most of the parameters viz. haemoglobin ($P < 0.05$), RBC, PCV and MCV were decreased significantly ($P < 0.001$) but TLC and all biochemical and enzymatic parameters such, as glucose, aspartate aminotransferase and alkaline phosphatase were significantly ($P < 0.001$) higher in camels after the work in evening time. It was concluded that intense draughting work influences physiological, haemato-biochemical and enzymatic parameters in camels.

Key words: Draught work physiology, haemato-biochemical, enzymes, dromedary camel



Oxidative stress in pregnant and lactating camels

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Abstract

Biomarkers of oxidative stress malondialdehyde, catalase, reduced glutathione and plasma vitamin E were evaluated in pregnant, lactating and non pregnant non lactating Indian camels. Whole blood levels of malondialdehyde (lipid peroxidation product) were significantly higher in pregnant camels (28.11 ± 0.44 nanomol/ml) than the non pregnant non lactating (25.86 ± 0.91 nanomol /ml). Levels of catalase (antioxidant enzyme) and reduced glutathione (antioxidant protein) were also lower in pregnant and lactating camels than the non pregnant non lactating camels. Study showed that levels of oxidative stress biomarkers are higher in pregnant and lactating camels than the control non lactating non pregnant camels.

Keywords: Camels, catalase, lactation, malondialdehyde, oxidative stress, pregnancy, reduced glutathione



A comparative study on the physicochemical parameters of camel and buffalo milk

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Abstract

This research work was carried out to compare the various physicochemical parameters of two species, camel and buffalo. Camel milk samples were collected at National Research Centre on Camel, Bikaner and buffaloes milk samples were collected from the surrounding villages of Bikaner. After collection milk samples were brought to the laboratory of NRCC Bikaner and they were analyzed for fat, SNF (Solid Not Fat), protein, lactose, total ash and pH using milk analyzer (Lactoscan). Camel milk had 2.71 ± 0.11 fat, 6.91 ± 0.03 SNF, 2.23 ± 0.02 protein, 3.86 ± 0.02 lactose, 0.79 ± 0.004 total ash and 6.95 ± 0.01 pH while buffalo milk had 8.71 ± 0.82 fat, 8.44 ± 0.19 SNF, 4.11 ± 0.02 protein, 4.46 ± 0.15 lactose, 0.98 ± 0.05 total ash and 7.59 ± 0.02 pH. Fat, SNF, protein and pH of buffalo milk was significantly ($P < 0.001$) higher than camel milk. Lactose and total ash in buffalo milk was also higher than camel milk but at $P < 0.05$ level. So it can be concluded that all the studied parameters were high in buffalo milk than camel milk.

Keywords: Fat, SNF, Protein, Lactose and Milk Analyzer.



Primarily human pathogenic fungi causing dermatophytosis in camel

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Abstract

In our earlier reports on camel dermal mycoses we have described about *Candida albicans*; *Alternaria alternata*. In this paper fungi reported to be causing primarily human infections viz. *Epidermophyton floccosum* and *Scopulariopsis brevicaulis* are described. Both of these fungi were found to cause skin infections in camel, and infected many animals of that particular herds. This condition was particularly observed due to high rainfall, leading to high humidity in the environment along with diurnal temperature variations.

Keywords: Camel, epidermophyton, scopulariopsis, skin



Camel dermal mycoses caused by dermatophytes

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Abstract

The species of common dermatophytes i.e. *Microsporum* and *Trichophyton* isolated from camel skin lesions included *M. audouinii*, *M. canis*, *M. nanum*, *M. ferrugineum*, *T. verrucosum*, *T. mentagrophytes*, *T. schoenleinii*, *T. equinum*, *T. concentricum*, *T. tonsurans*, *T. violaceum*, *T. soudanense* and *T. rubrum*. These fungi caused sporadic cases of skin infections in individually maintained camels as well as affecting many camels in the herds. These fungi create distinctive lesions of ring worm. The lesions of ring worm observed with *Trichophyton* spp. were comparatively dry, hard, crusty, granulomatous and larger in size.

Keywords: Camel, dermatophytes, skin



Antibacterial activity of vegetable herbs against intramammary infections in camels

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Abstract

In vitro antibacterial activity of garlic (*Allium sativum*), lemon (*Citrus limon*), bitter gourd (*Momordica charantia*), onion (*Allium cepa*) and aloe vera (*Aloe babadensis*) was evaluated against bacterial isolates, *Staphylococcus aureus*, *Staph. epidermidis*, *Bacillus* spp., *Corynebacterium* spp. and *Micrococcus* spp., of intramammary infections in camels. Results were interpreted as +, ++ and +++ as per their zone of inhibition. Maximum antibacterial sensitivity was exhibited by garlic followed by lemon, bitter gourd and onion, whereas aloe vera did not show any antibacterial activity. In vivo distilled water diluted garlic juice (1:1) administered @ three ml per quarter through intramammary route with blunt syringe recorded 57.1 % efficacy of treatment. Lemon juice did not show any sign of recordable recovery. In control group neither spontaneous recovery nor new infections were observed.

Keywords: Antibacterial, vegetable herbs, mastitis and camel



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