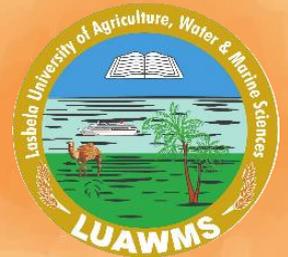
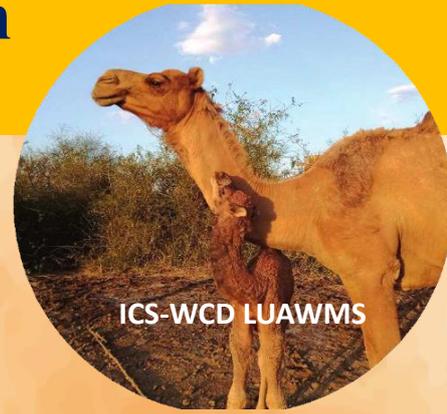


International Camelid Symposium

in connection with WORLD CAMEL DAY (June 22-26, 2020)



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ABSTRACT BOOK

Editor
Illahi Bakhsh Marghazani

LASBELA UNIVERSITY OF AGRICULTURE, WATER & MARINE SCIENCES (LUAWMS)
UTHAL, PAKISTAN

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Prof. Dr. Dost Muhammad Baloch
Vice Chancellor, LUAWMS



Camel is a unique species that naturally gifted with hidden potentials of producing milk and meat. In Pakistan, this specific region “Balochistan” is blessed with major chunk of camel population comprising 41% of total camel heads. Unfortunately, despite of God gifted blessings, we are being scientists of biological sciences, livestock experts and policy makers did not put our due attentions and contributions for the development of camel, its husbandry practices and camel framing community. Nevertheless, at provincial level, we started with taking small but effective initiatives of initiating research projects and highlighting strengths and weaknesses so that our research, policies, and practices may involve development of camels and poor camel farmers. Recently, for this specific region of Pakistan, we also issued Policy Paper on “*Balochistan-The Hub of Camelids in Pakistan, bottlenecks, strengths and strategies to conserve and develop camels and camel community in Balochistan*” which will definitely divert attention of all stakeholders to pay consideration to this ignored species. We are also working on supporting camel as priority species for research studies in different disciplines of Veterinary and Animal Sciences.

During this ongoing COVID-19 pandemic, where it severely shattered the health, peace and economics of the whole world, it also opened some windows of opportunity for the world to use soft online applications to carry out business, administrative and academic activities. This overall perception-change also let us to surface out a brainchild for conducting online event “International Camelid Symposium” from June 22-26, 2020 at LUAMWS. With the commitment and passion of my team, ICS-WCD event successfully conducted which gathered world camel researchers and experts from around the globe who shared research and expert opinions to utilize the potentials of camels for the benefits of mankind.

Being Organizing Chair of ICS-WCD event and Vice Chancellor of LUAWMS, I pay thanks to all National and International “Invited Speakers” for their valuable talks and being part of this event. We are grateful to all participants and collaborators Agriculture Linkages Program, Pakistan Agriculture Research Council (ALP-PARC), Agro-Business Coaching and Development (ABCD) TV, Camel Association of Pakistan (CAP) and specially Altech Pakistan Private Limited who well supported us to conduct this event in an effective manner.

It is good to share that after COVID-19 pandemic and restoration of normal life in the world, we have planned to organize “1st International Camel Congress (ICC)” at LUAMWS with an aim to support significance of this unique species particularly in scenario of climate change and food security. We believe and expect strong support and coordination from camel researchers, experts, and collaborators around the globe. Along with this, we believe that this tentative event will be great opportunity for the participants and speakers to visit beautiful landscape, beaches and historical places of Balochistan, Pakistan.

Stay safe.

Organizers & Collaborators of ICS- WCD

<p>Prof. Dr. Dost Muhammad Baloch</p> 	<p>Organizing Chair</p>	<p>Vice Chancellor Lasbela University of Agriculture, Water and Marine Sciences (LUAWMS), Uthal, Pakistan</p>	
<p>Prof. Dr. Illahi Bakhsh Marghazani</p> 	<p>Organizing Secretary</p>	<p>Principal Investigator PARC-LUAWMS Camel Project (AS010) Faculty of Veterinary & Animal Sciences, LUAWMS</p>	
<p>Dr Naveed Shahzad Jadoon</p> 	<p>Co-organizer</p>	<p>Director/CEO Altech Pakistan Private Limited</p>	
Other Collaborators			
<p>Agriculture Linkages Program, Pakistan Agriculture Research Council (ALP, PARC)</p>			
<p>Agri-Business Coaching and Development TV</p>			
<p>Camel Association of Pakistan (CAP)</p>			

Invited Speakers ICS-WCD

Speaker	Topic	
Dr Selda Bulca (Turkey)	Investigations of Possibilities to Produce Yoghurt from Camel Milk	
Christina Adams (USA)	Autism, Camel milk and related issues	
Dr Nisar Ahmad Wani (UAE)	Assisted Reproductive Biotechnology Techniques to enhance production in Old World Camels	
Dr Abdul Razik Kakar (UAE)	Camel Dairy is a future hope in climate change	
Prof. Dr. Afaf Kamal Eldin (UAE)	Camel milk uniqueness lacks supportive mechanisms	
Dr Tahereh Mohammadabadi (Iran)	Medicinal (Therapeutic) value of camel milk (anti-diabetes and anti-microbial effects)	
Dr Asim Faraz (Pakistan)	Growth potential of Marecha Camel in different management systems: Ministerial insinuations	
Dr. Kashif Ishaq (Pakistan)	Attributes and Peculiarities of camel Beef for securing the food in Desertification	

Abstract Review Committee ICS-WCD

1. Prof. Dr. Illahi Bakhsh Marghazani LUAWMS, Uthal
2. Dr. Nasrullah Bangulzai LUAWMS, Uthal
3. Dr. Abdul Hameed Baloch LUAWMS, Uthal
4. Dr Shahid Faraz LUAWMS, Uthal
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8. Dr. Kashif Ishaq PMAS Arid Agric. Uni. Rawalpindi
9. Dr Saeed Ahmad UVAS, Lahore
10. Dr Farman Sial SAU, Tandojam

ABSTRACTS

**ASSISTED REPRODUCTIVE BIOTECHNOLOGY TECHNIQUES TO ENHANCE
PRODUCTION IN OLD WORLD CAMELS**

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ABSTRACT

This abstract highlight recent developments in the field of assisted reproduction, including collection and handling of gametes, in vivo and in vitro embryo production, and transfer with special emphasis on cloning by somatic cell nuclear transfer in camels. Recently, remarkable progress has been made in some of these fields, however; still a lot needs to be done to optimise the productivity in this species. Artificial insemination, which is being routinely used in cattle breeding programs, is still a distant dream due to non-availability of semen freezing protocols in this species. There had been, however, a steady progress in the application of embryo production and transfer, which is now being utilized by many institutions to multiply their elite animals. Calves have been produced from transfer of in vitro and in vivo produced embryos to surrogate mothers by different labs with varying success rates. The first cloned camel was produced in year 2009 by our center, which followed by the production of many more calves in subsequent years. The process involves in vitro embryo production and their transfer to synchronized recipients. Even though we have a high in vitro embryo/blastocyst production rate but still have low pregnancy rates as is true for most of the animal species. The establishment of pregnancies and production of a healthy cloned calf is dependent on a multitude of factors involved in the process. These factors range from reprogramming of cell in the cytoplasm, in vitro development of the reconstructed embryo before transfer into surrogate mothers, triggering the proper signals for maternal recognition of pregnancy in uteri, development of a functional placenta, formation of well-differentiated cells that will result in the development of fully competent tissues and organs, completing the normal gestation period and triggering the delivery process. Although the efficiency of nuclear transfer has improved significantly during the recent years, still there is low success rate combined with increased pregnancy and neonatal losses observed by all the research groups including us.

Keywords: *Assisted reproduction, In vitro, Artificial Insemination, Cloned camel*

AUTISM, CAMEL MILK AND RELATED ISSUES: INSIGHT, TREATMENT AND SCIENCE

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ABSTRACT

Autism, or autism spectrum disorder (ASD), refers to a range of conditions characterized by challenges with social skills, repetitive behaviors, speech and nonverbal communication. Motor skill impairment, food sensitivities and gastrointestinal issues are common in the population. While genetic abnormalities in autism spectrum disorders are increasingly explored, recent studies implicate physiological and metabolic abnormalities in autism spectrum disorders, particularly immune dysregulation or inflammation, oxidative stress, mitochondrial dysfunction and environmental toxicant exposure. It is theorized that camel milk addresses allergic response and inflammation in ASD and other inflammatory diseases. Research-based evidence suggests that camel milk is rich in enzymes, antibodies, and vitamins that benefit autistic children. Parents who have fed their autistic children camel milk have reported benefits including better sleep, increased motor planning abilities, improved spatial awareness, more eye contact, better expressive language abilities, resolution of skin disorders and fewer gastrointestinal problems. The milk contains higher amounts of bioactive and antimicrobial substances than cow and buffalo milk. An insulin-like protein may contribute, as well as GABA and pre and probiotics along with other factors. Camel milk differs from cow milk in the beta casein distribution and other factors. The b-lactoglobulin levels are not measurable (similar to human breast milk); the most common serum protein is a-lactalbumin, and it offers greater digestibility than cow milk. Improved safe distribution of camel milk would benefit autistic, diabetic, failure to thrive, food-intolerant and other patients. Patients with autism often react poorly to plant-based, bovine, sheep and goat milks and are in need of non-reactive milks. Marked improvement has been noted from the addition of camel milk, especially in the absence of problematic milks.

The book *Camel Crazy: A Quest for Miracles in the Mysterious World of Camels* (2019, New World Library) covers the development of Adams' initial hypothesis that camel milk would help her son's autism symptoms by impacting his immune function. It outlines the development and present status of camel milk as a health supplement, cites emerging science, and investigates the knowledge of current camel-owning cultures. A user's guide to camel milk with suggested serving sizes for various disorders and a list of global milk sellers is included in the book, along with insight from scientists and veterinarians.

Keywords: *Autism, Camel milk, Constituents, Health, Case study*

CAMEL MILK UNIQUENESS LACKS SUPPORTIVE MECHANISMS

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ABSTRACT

Camel milk is uniquely different from bovine and other milks in several properties including proven antidiabetic effects and other health benefits. Camel milk has several opportunities due to its health properties but faces many challenges mainly related to difficulties facing its coagulation into yoghurts and cheeses. The components and mechanisms responsible for its health benefits and anti-coagulation properties are not yet known. An important difference between camel and bovine milk concerns the relative ratios of the α s1-, α s2-, β -, and κ -caseins being 26 : 4 : 67 : 3 and 40 : 10 : 40 : 10, respectively. The low prevalence of κ -casein and large abundance of β -casein are believed to stand behind the poor coagulation properties of camel milk. In addition, camel milk whey proteins lack β -lactalbumin, which is very important for the formation of yoghurt gels but is very rich in α -lactalbumin, serum albumin, immunoproteins, namely lactoferrin, immunoglobulins, lysozyme, lactoperoxidase, insulin and insulin-like proteins. Future research needs to address some critical questions, mainly the milk components that are responsible for its different health benefits and their mechanisms of action.

Keywords: *Camel milk, Immunoproteins, Casein, Health benefits*

DEVELOPMENT OF CORPUS LUTEUM USING EQUINE CHORIONIC GONADOTROPIN AND INDUCTION OF OVULATION: A CASE STUDY TO MAINTAIN PREGNANCY IN AN ELITE SHE-CAMEL (CAMELUS DROMEDARIUS)

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ABSTRACT

Luteal insufficiency is a major cause of recurrent embryonic losses in mammals and similarly in dromedary camels. Various regimes are applied to enhance luteal function using luteotrophic agents, induction of accessory corpus luteum (CL) and supplementation of progesterone (P4). In the present case study, an elite cyclic she-camel was mated with a fertile elite racing bull in repeated estrous cycles (n=2, follicle size at mating time=12-16mm). After each mating, CL size and P4 concentration was estimated at day 7 and 14 and embryonic vesicle at day 20 and 30. In each cycle, P4 concentration was 1.4 ± 0.51 and 1.8 ± 0.6 ng/ml while CL size 12 ± 0.8 and 14 ± 1.1 mm at day 7 and 14 respectively. Embryonic vesicle was found at day 20 (pregnancy positive) and negative at day 30, depicting embryonic loss between 20-30 days. CL size and P4 concentration was not comparable ($P < 0.05$; using t-test in SAS Enterprise Guide 4.2) mentioned in literature ($P4 > 2.0$ ng/ml to maintain pregnancy effectively. In next estrous stage, female was mated and supplemented with P4 (50mg daily, IM; Jurox) starting at day 3 of mating until day 15 and gradually reduced over two weeks. Meanwhile, female was injected with equine chorionic gonadotropin (eCG, 1500 iu; IM, Folligon®) at day 7 to initiate the formation of multiple follicles. Ultrasonography revealed the presence of three mature follicles (11-14mm) at day 15 at each ovary. Female was injected with gonadorelin (Gonavet®; 2mL) to induce ovulation. Ovulation were confirmed 48h of gonadorelin injection and formation of accessory CL's at day 20 along with presence of embryonic vesicle. The formation of three accessory CL's was confirmed at day 20 and 30. Female was found positive for pregnancy at day 30, 60 and 90 and later a healthy calf was delivered at full term. These results conclude that use of eCG can induce formation of follicles when P4 is being supplemented to an early pregnant she-camel. These follicles can be induced for formation of accessory CL to maintain pregnancy to full term.

Key words: *Corpus Luteum, Equine chroinic gonadotropin, Pregnancy, Dromedary Camel, Induction*

GROWTH POTENTIAL OF MARECHA CAMEL IN DIFFERENT MANAGEMENT SYSTEMS UNDER THAL CONDITIONS

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ABSTRACT

Camel role in economy of marginal areas is well documented but still it is one of the ignored species in Pakistan. Being valuable genetic resource, it is need of time to explore its production potential different management systems under natural milieus. This study covers the growth performance of Marecha camel in extensive, semi-intensive, intensive and feedlot systems which was conducted at Camel Breeding and Research Station, Rakh Mahni, Distt Mankera in Thal region. In first trial, eighteen Marecha calves were allotted randomly to three comparable groups of 6, (3 ♂ and 3 ♀) each. First group animals were reared under intensive management system (IMS), fed concentrate @ 1 kg/h/d plus gram straw (*Cicer arietinum*) *ad libitum*; in second group, calves were reared under semi-intensive management system (SIMS), sent for grazing 8 hours daily plus gram straw *ad libitum*; while in third group the calves were reared under extensive management system (EMS), allowed grazing for 10 hours daily along with household supplementation. The mean BWt and ADG of male and female calves differed significantly ($P<0.05$) among groups being higher in IMS followed by EMS and SIMS. The ADG was found to be 674, 649 g/d in males and females under IMS; 539, 436 g/d in males and females under EMS; 419, 376 g/d in males and females under SIMS, respectively. Feed intake was significantly different among groups. In second trial, 10 weaned male Marecha calves were raised in two groups with 5 each under feedlot conditions. They were offered roughage and concentrate at the ratio of 60:40. In 60 proportions the ratio between Alfalfa and gram straw was 70:30. They were fed two iso-caloric and iso-nitrogenic diets with 18 and 22 % CP. Daily feeding allowance was calculated at 3 % of body weight and adjusted according to fortnightly weighing. The ADG was 953 and 996 g/d with 18% and 22% levels of protein ration, respectively while AFI was statistically similar between two groups. The results were counter checked by assessment of body condition scoring and back fat layer measurement and related to daily weight gain; the values were found to be varied linearly. Moreover, the results indicated that weaning was more economical and resulted in savings of 125 and 117 \$ in calve groups I & II, respectively. This indicated a great potential of growth to become a good candidate for feedlot system in desert conditions. This study will not only condense the thirst of scientific community by plotting footprints to develop database line for camel production but will also pave the way to reconnoiter novel and unmapped areas to provide solid recommendations for camel farming community in desert conditions.

Keywords: *Marecha Camel; Growth potential; Management Systems; Rakh Mahni, Thal*

CAMEL MILK IN BALOCHISTAN: AN UNEARTHED PRODUCT NEEDS COLLABORATIVE STRATEGY TO ALLEVIATE POVERTY OF CAMEL FARMERS

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ABSTRACT

Pakistan stands eighth major camel populous country of the world. Balochistan shares 41% camel population of Pakistan. The camel despite of healthy total strength and naturally gifted milk and meat potentials remained neglected by policy makers both at provincial and national levels. Of the twenty camel breeds documented at national level, seven breeds are native to Balochistan. Having all these resources of camel wealth, it is unfortunate that sale of camel milk is considered as “Forbidden Tree” among camel farming community of Balochistan due to some misconceptions. Of approximately 0.4 million camel heads in Balochistan, 0.32 million are found in top ten major regions i.e., Kharan, Kholu, Dera Bugti, Bolan, Lasbela, Khuzdar, Killa Saifullah, Musa Khail, Chaghi and Kalat. Rests of these top ten regions, other areas have less than 0.010 million camel population. On the basis of few assumptions i.e., half of the documented camel strength are she-camels, half of she-camels are adult, half of adult she camels are lactating and producing average yield of 4L/d; it is estimated that an average 1,65,860 L/d camel milk is being produced in these top ten regions of Balochistan. For estimating monetary worth at nominal cost i.e., Rs.100/L camel milk, it is found that 16 million rupees is being wasted per day in these regions. Of this value, if half of camel milk is fed to calf or used for home consumption, still 240 million per month and 2880 million per annum is being unearned. Hence, there is dire need to chalk out collaborative strategy by the provincial government, non-government organizations and academia for educating camel farmers through field schools and facilitating through milk collection, transportation and marketing interventions.

Keywords: *Camel, Milk, Poverty, Market, Income, Balochistan*

BRUCELLOSIS IN IRANIAN CAMELS, SO IMPORTANT, SO IGNORED

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ABSTRACT

Brucellosis is one of the most important zoonosis that cause stillbirth, abortion and infertility and lowering the efficiency of milk and meat production in livestock. Camels are susceptible to *B. abortus* and *B. melitensis*. Camel brucellosis is characterized by lesions of lymph nodes and joint capsules, orchitis and epididymitis, inflammation of the uterus, abortion, and reduced fertility. Also, many infected camels are silent carriers of brucellosis. The first study on camel brucellosis in Iran was carried from 1986-87 using 3500 lymph nodes and 953 serum samples from 300 camels. 8% of serum samples were positive in serological tests and *B. melitensis*, biovar 1 and 3 were isolated from these lymph nodes in 1% (3/300) of the camels. DNA in blood and lymph nodes of Iranian camels and seroprevalence range from 1.3 to 9.3% but the absence of clinical signs. Brucellosis is one of the causes of abortion in camels, reported 14-32.5% of aborted camel fetuses were positive for *B. melitensis* and *B. abortus* in different regions of Iran. Camel milk is part of camel keeper diets. *B. abortus* isolated from raw camel milk and detected in 14.5% of samples by PCR in Iran and since it is consumed untreated, it could be a dangerous source of brucellosis. The value of dromedaries can be very high. Most of the brucellosis-positive camels are clinically healthy animals and owners do not allow their Brucella serologically positive animals to be culled. Therefore, the author proposes that the best way to halt the spread of the disease is to castrate serologically positive bulls, never breed positive females and start vaccination in positive herds.

Keywords: *Iran, Brucellosis, Camel, PCR*

POSSIBILITIES TO PRODUCE YOGHURT FROM CAMEL MILK

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ABSTRACT

Recently, the use of camel milk has increased as a new and alternative animal protein source for human consumption. However, there are some differences in the composition of camel milk compared with other kind of milk sources. One of these differences is that camel milk contains in high concentrations of antimicrobial agents such as lysozyme, lactoferrin, lacto-peroxidase and immunoglobulins. In many studies, it was reported that camel milk is not suitable for production of fermented milk especially for yoghurt due to the high concentration of antimicrobial substances. Firstly, in this study, viscosity and pH changes in yoghurt produced from cow and camel milk were compared. For this purpose, both milk were heat treated at 80°C for 20 minutes. After 180 minutes in cow's milk, the viscosity was 9891 mPa.s, and after 210 minutes it reached 25237 mPa.s. In contrast, the viscosity in cultured camel milk was determined as 1210 mPa.s after 90 minutes, while the viscosity remained around 1216 mPa.s after 380 minutes. As viscosity of cultured camel milk not increased, hence, suitability of the mixture of camel milk with different ratio of cow, sheep and goat milk for yoghurt production was investigated. After preparing of milk mixtures, these were heat treated at 90°C for 15 minutes and cooled at 45°C. The starter culture (YC 350) was added and incubated at 42°C until the pH reached 4.7. During fermentation, every hour the pH, SH and viscosity were measured. According to the results of analysis in which the highest viscosity and the fastest pH drop, mixtures were chosen as optimum points for yoghurt production. In these optimum points yoghurt productions were performed and all the samples were stored for 1, 7, 14. and 28 days at 4°C. During the storage, water holding capacity and syneresis analyses were conducted. According to the results, the optimum mixture was determined at 80%:20% cow milk: camel milk mixture. However, after 4 weeks of storage it was concluded that an increase in the syneresis and a decrease in water holding capacity (%) were found for yoghurt obtained from 80%:20% cow-camel milk mixture.

Keywords: *Camel milk, Yoghurt production, Viscosity, pH, Syneresis, Water holding capacity*

EFFECT OF DIFFERENT LEVELS OF USED CHICKPEA (CICER ARIETINUM) ON PROPERTIES OF CAMEL MEAT SAUSAGE

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ABSTRACT

This study was conducted to investigate the effect of different levels of used chickpea (cicer arietinum) on properties of camel meat sausage. The lion cut was purchased from Abuzaid camel meat market to obtain whilst chickpea was obtained from Libya market, Khartoum. Chickpea (cicer arietinum) was added with 15, 20, 25 and zero percent to prepare camel meat sausage. Chemical composition, cooking loss, water holding capacity (WHC), pH and sensory evaluation were determined. Results showed that addition of 20% chickpea (cicer arietinum) significantly increased ($P<0.05$) protein and ash contents and decreased ($P<0.05$) moisture and fat content. Physical characteristics indicated that pH and WHC were significantly maximum ($P<0.05$) at 20% level than other studied levels of chickpea. Overall acceptability was similar ($P>0.05$) in color, flavor, tenderness and juiciness. It was concluded that Chickpea (Cicer arietinum) can be introduced as non- meat additive in camel meat sausage at the rate of 20%.

Keywords: *Camel sausage, Chemical, Physical, Sensory, Properties*

EFFECT OF RECOMBINANT CAMEL CHYMO SIN ON THE PHYSIOCHEMICAL, RHEOLOGICAL AND SENSORY CHARACTERISTICS OF SOFT CHEESE (DOMIATI TYPE) MADE FROM CAMEL'S MILK

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ABSTRACT

The possibility of using recombinant camel chymosin as a new coagulant in the production of soft cheese (Domiati type) from camel milk was investigated. For this purpose, Domiati cheeses produced by using recombinant camel chymosin (CM) and camel rennet (CR) were compared in terms of their physiochemical, rheological and sensory properties at 1, 15, 30 and 60 days of storage. The cheese made with CR had significantly ($P<0.05$) higher ripening index than in cheese made with CM. Also, at the end of ripening period Tyrosine & Tryptophan contents of CR cheese were significantly higher ($P<0.05$) than in CM cheese indicating that CM had considerably lower proteolytic activity than CR. The yield of fresh cheese made with CM was higher ($17.4\pm 0.2\%$) compared to cheese made with CR ($12.5\pm 0.3\%$). Texture profile analysis demonstrated that, the cheese made with CM were significantly ($P<0.05$) exhibited higher hardness and chewiness than cheese made with CR. The results of this study suggest that CM can be used successfully in the manufacture of Domiati cheese from camel milk and that can improve the cheese yield and good sensory quality with lower levels of proteolysis.

Keywords: *Camel milk, Camel rennet. Recombinant camel chymosin, Domiati cheese*

ATTRIBUTES AND PECULIARITIES OF CAMEL BEEF FOR SECURED FOOD UNDER DESERTIFICATION

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ABSTRACT

Food security is the main issue in developing countries. Pakistan is agriculture based economy where livestock sector is the major contributor in value added in agriculture. However, still there is the crisis of protein quality in Pakistan. There is need to work out alternative protein sources especially for the resources lacked deserts. The camel beef is the one of easiest solution in these areas. The meat of the camel is the byproduct as the male animals are preferably kept as baggage animal while the female camel also serves as dairy purpose. There are about 0.17 million camels are slaughtered annually in the world. In Pakistan, annually about 24000 camels are slaughtered. The camel meat quality varies with the feeding, breeds, age and its methods of the processing. However, the camel produces high quality food with low cost. Usually the camel meat is the products of spent animal in Pakistan. On average, the birth weight of different camel breeds varies between 30-45 kg in Pakistan. While average mature weight of different local breeds varies between 400-800 kg. These animals are slaughtered in special way (incision at three different spot on neck). The best age regarding the good quality meat is 1-3 year for slaughtering. The dressing percentage in local breeds varies from 45 to 55%. Male camel has proportionally more carcass yield as compare to she-camel that has more fat content. 34% of the carcass is from the forequarter while 25% from the hindquarter. The quality characteristics of camel are not different from the beef. The color of the meat varies from raspberry red to dark brown. Its taste is sweetish due to high glycogen content in the muscles. The fat of the camel is white in colour. The toughness increases while the palatability decreases with increase in the age of the animal. Optimum age is 1-3 years. Ultimate pH is ranging 5.7 to 6; it depends on the amount of glycogen and lactic acid. The oleic acid is most dominant in concentration followed by palmitoleic acid. Out of ten poly unsaturated fatty acid (PUFA), linoleic acid is the principle PUFA. The PUFA are 18.6% that are more than beef but less than buffalo. The meat of camel has 71% moisture, 21.4% protein, 4.4% fat and 1.1% ash (almost same composition as beef). The camel meat like other red meat has higher potassium followed by phosphorous, sodium, magnesium and calcium. The tough structure of some of the camel meat cuts are due to high concentration of the calcium. Commercial meat production is the very important topic of research and would be the alternate option in the future for our country where the land and feed resources are not optimum for livestock and are decreasing day by day.

Keywords: *Camel; Carcass; Meat; Desert; Food Security*

RELATIONSHIP OF SEASONAL FACTORS WITH MILK COMPOSITION OF DROMEDARY CAMELS KEPT UNDER INTENSIVE MANAGEMENT DURING SUMMER

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ABSTRACT

The milk composition of dromedary camels widely varies due to various genetic, physiological, management and seasonal factors. Season strongly impacts the camel milk composition via feed quality, heat stress and water availability. The relationship between the seasonal factors and camel milk composition has been studied previously with inconclusive results under variable extensive and semi-intensive management conditions. Moreover, the work under intensive management is scarce on the effect of seasonal factors, particularly in Pakistan. The present study was conducted to assess the relationship of seasonal factors with milk composition of Brelia dromedary camels kept under intensive management during summer months in Bahawalpur region. The total summer season was divided into dry summer (May 01 to June 30) and humid summer (July 1 to September 15). A total of 15 Brelia she-camels of approximately same age, weight, lactation number and stage of lactation were kept under standardized intensive management and feeding conditions (without any grazing) at Camel Farm established under Punjab Agricultural Research Board (PARB) Project 509. The morning and evening milk samples were collected and analyzed for percent fat, protein, lactose, solids not fat (SNF), salts, and density and P^H using Lactoscan Milk Analyzer. Data were analyzed by calculating Pearson's correlation coefficient (r) among various seasonal factors and milk composition parameters (P<0.05). There was a strong positive correlation (P<0.05) of daily maximum temperature with milk protein, lactose and total salts during dry summer. Relative humidity had a strong negative correlation (P<0.05) with milk fat during dry summer. Similarly, rainfall had a strong negative correlation (P<0.05) with protein, lactose and total salts of milk both during dry and humid summer, and with SNF and density during humid summer. In conclusion, the seasonal variations during summer strongly affect the gross composition of camel milk. This effect on milk constituents is adverse during periods of high relative humidity and rainfall. More research is needed to delineate the management and nutritional practices to improve the milk composition of camel during extreme summer months.

Keywords: *Brelia camel, Intensive management, Milk composition, Summer season*

MEDICINAL (THERAPEUTIC) VALUE OF CAMEL MILK (ANTI-DIABETES AND ANTI-MICROBIAL EFFECTS)

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ABSTRACT

Camel milk has unique properties for the health. The amount of vitamin C, Mg, Fe, Cu, Zn and unsaturated fatty acids in the camel milk is more than cow milk. Also, camel milk lactose is digestible for lactose intolerance cases. Lack of β -lactoglobulin and low β -casein in the camel milk make it a great alternative for kids with allergy to cow milk. The higher ACE inhibitory peptides of the fermented camel milk have anti-hypertensive effects and casein hydrolysates of camel milk reduced cholesterol levels. Protective proteins of camel milk are including; lactoferrin, lactoperoxidase, lysozymes, immunoglobulins and peptidoglycan recognition protein that have medicinal properties. Small size immunoglobulins of camel milk boost the immune system. Furthermore, lactic acid bacteria of camel milk are effective on the gut and colon health. Half-cystine, lactoferrin and antimicrobial peptides of camel milk promote the proliferation of *Bifidobacterium* species and inhibit gastrointestinal bacterial infections. High amount of antioxidant of camel milk play an important role in decreasing oxidative stress and improve autistic behaviors. Camel milk (raw and fermented products) has therapeutic effects on stomach ulcers, liver disorders, diarrhea, cancer, chronic hepatitis, autism, cardiovascular problems, skin issues, crohn's disease, inflammation, food allergies, tuberculosis and chronic diseases of the gastrointestinal tract. Camel milk has anti-diabetic activity in type 1 and 2 and gestational diabetes possibly because of insulin like protein that covered by fat micelles and not destroyed in the stomach. Camel milk has immune-modulatory effects on the pancreas β -cells and reduces diabetes complications. Camel milk immunoglobulins and IgGs combat autoimmune diseases by strengthen the immune system and protect the body from bacterial and viral infections. Camel milk contains various protective proteins and enzymes which have antibacterial and immunological properties. Symptoms of tuberculosis such as cough, sputum and chest pain in drug-resistant patients improved by camel milk. The camel milk has antimicrobial activity against foodborne pathogens. The high lactoferrin of camel milk is as a primary drug against HCV infection and inhibits virus entry into the cells. The raw camel milk has anti-diabetes, anti-microbial and immunological properties. But it is a threat for health due to contamination with pathogenic bacteria. Without heating, storage at high temperature with low hygienic conditions may spoil camel milk. But heat treatment in high temperature destroys vitamin C, lysozyme, lactoferrin, immunoglobulins, lactic acid bacteria growth, anti-diabetic properties and anti-microbial effects as well as protective proteins of camel milk. It needs more researches to study the effectiveness of heating and cooling process such as pasteurization, sterilization and freezing of camel milk for treatment aims.

Keywords: *Anti-diabetes, Anti-microbial, Camel milk, Medicinal*

A REVIEW ON PARATUBERCULOSIS IN IRANIAN CAMELS

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ABSTRACT

Paratuberculosis (John's disease) is infectious and chronically progressive granulomatous disease which affects domestic and wild ruminants. The causative agent is *Mycobacterium avium paratuberculosis* (MAP), a slow growing mycobactin dependent acid-fast bacillus. There are around 180,000 Old World Camels (OWCs) including one-humped (dromedary) and two-humped (Bactrian) camels (only 100–300 individuals) in Iran and raised for several purposes including milk, meat, and wool production, showing and racing. The review discusses the current available information of the disease epidemiology of paratuberculosis infection in Iranian camel. In dromedaries of Iran, some studies on the prevalence of paratuberculosis in different provinces. Overall prevalence based on AFS of fecal and intestine smears varied between 0% and 15.3%. Reports using ELISA, fecal and blood sample PCR show 2.2%, 8% and 7.3% of infection rate respectively. In Iran, there is also one report of a paratuberculosis infection of a two-humped camel (*Camelus bactrianus*). In this study, Acid fast staining results showed that 15.3% samples of Bactrian camels were suspected to MAP but no bands corresponding to MAP detect in all samples by PCR assay of fecal. Also one outbreak of paratuberculosis in dromedary herds associated with chronic diarrhea and weight loss have been documented in Iran. Johne's disease has a global distribution in ruminants and in the last few years, the disease prevalence has increased in camels. While adequate research on control of *paratuberculosis* in camels is extremely rare, but published data on control measures in cattle and other ruminants can be used. Effective program to control the disease includes test and culling, management modification, and vaccination.

Keywords: *Iran, Paratuberculosis, Camel*

CAMEL DAIRY IS A FUTURE HOPE IN CLIMATE CHANGE SCENARIO

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ABSTRACT

Camel is making its space as dairy animal in different parts of the world. South Asia is one of the driest and challenging landscapes on the face of the earth, making it a hostile ecosystem for many other livestock species. The nature blessed the region with the highly adapted and specialized livestock species, but the camel is the most unique but incredible. Camel is the animal of exceptional characteristics' making it the most valuable creature on the earth, especially of the drylands. The people living in this region, especially the camel herders and pastoralists depend on the camels for food, accessibility and other livelihoods since ages. Not only accessibility but produces milk in very high ambient temperatures and other climatic challenges; in the same environment other livestock species are hard to survive. In the climate change scenario and fragile security conditions, camel is the animal of choice to provide precious food items as milk and meat to ensure survival of the people in a very low input production systems. Based on personal experience and scientific discoveries, camel is the most sustainable farm animal for the region with wide climatic conditions. The cow model (exotic cow dairies) is hardly sustainable in such a hostile ecosystem and the milk produced is very expensive if calculated in the ecosystem model; as cow needs more water to produce a liter of milk (8-10 times more in same environment). The camel tolerate very high ambient temperatures, on contrary the cow needs cooling system to produce milk in alike milieu. Such cooling systems are mainly performed based on water consumption. The production potential is very appreciable, especially when modeled in the frame of the input system. Among the lactating camels (at our facility), > 20% camels keeps yielding above 25 kg milk/day. The camel can calve up to 10 times but the exotic cow can hardly calve 4 times in her reproductive life in the same environmental conditions. The quality of camel milk is very appreciating than that of cow milk. Free of allergen protein, intolerant lactose and low in saturated long chain fats making the camel milk the best choice for health sensitive people. The region needs to ensure joint efforts for making policies regarding the food and agriculture to keep the camel on top priority as animal of food security in climate change scenario. The organization "Camels4Life" which is an advocacy group supporting camel's cause, is always willing to support both governments and NGOs for finding ways to use camel as a sustainable farm animal contrast to its old vision of beast of the burden.

Keywords: *Sustainable farm animal, Arabian camel, Dry and deserted lands, Climate change*

GENETIC CHARACTERIZATION OF CAMEL BREEDS OF BALOCHISTAN USING MICROSATELLITE MARKER

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ABSTRACT

Camel is unique species and has ability to live in diverse ecological zones including deserts and hot regions. In Balochistan, camels husbandry is being practiced in six ecological zones ranging from zero to eight thousands feet above sea level. In past, this animal species has been used for transportation and draught purpose. The same trend of camel husbandry is still continued. There are certain regions of Balochistan which have more than one camel breeds. Lasbela is one of those regions, where Lassi and Makrani camel breeds exist. It has more than 30,000 camel heads and lies on 5th major camel populated region of Balochistan. In certain areas, the crosses of Lassi and Makrani camel breeds have developed into new hybrid, locally called Dati. This study conducted to know the genetic diversification of camel breeds of Lasbela region using microsatellite markers. For this purpose, blood samples from Laasi, Makrani and Dati (n=40) were collected to extract genomic Deoxyribonucleic acid (DNA). It was amplified by using microsatellite marker (VOLP10). Results (sequencing) showed >30 dimer GT repeats with a break of a dimer (TT). In few samples (n=5), the GT repeats were found continuously in heterozygous condition. These results showed existence of variation in camel breeds of Lasbela region. It was concluded that use of microsatellite markers can be used for genetic characterization of camel breeds and other livestock species.

Keywords: *Camel, Lassi, Makrani, Hybrid, Microsatellite, Markers*

WHAT DO WE KNOW ABOUT NON-PATHOGENIC VIRAL INFECTIONS OF CAMEL IN IRAN?

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ABSTRACT

There is considerable controversy in the literature on several viral diseases in camels. Although antibodies were detected in the sera of camels against certain viral agents, there was no evidence that camels manifested symptoms attributable to these viruses. In contrast, there is considerable dispute in the literature on the pathogenicity of certain other viruses in camels, as well as on the role of camels in their dissemination, possibly by acting as asymptomatic carriers. In Iran, FMD serotype ASIA-1, A87, A05 and O were isolated from camels and some FMD outbreak were reported but no antibodies against FMDV has been detected so far. Based on ELISA, 0.6% of camel sera were positive for antibodies against PPRV. Also one outbreak of PPR in imported camel from Kuwait associated with fever, oral erosion, yellowish diarrhea, pneumonia and respiratory distress and sudden death have been documented in Iran. Based on the serological tests, the prevalence of bluetongue in camel herds is between 5.9% to 67.8% in Iran. In 2006, BT symptoms were observed on 10 pregnant dromedary camels in a herd from Kerman province and antibodies against BTV in all of camel sera were detected by ELISA. BVD was detected in 19.7% of Iranian camels in 1966 using serum neutralization test. Further, 14/9% of camel fetus aborted in Iran are BVDV positive. In Iran, Surveys using serum neutralization test conducted on camels, detected no antibodies to BHV-1 but a survey on camel fetus aborted revealed 8/79% of samples are BHV-1 positive. CCHF was searched in 1972 in 19% of Iranian camels by AGDP and recently in 19% of samples by PCR. MERS-CoV were confirmed among 8 illegally imported camels from Pakistan into Iran and Panconavirus RNA was identified in 5.7% and 10.7% of nasal swab samples of Iranian camels respectively. Camel husbandry is a common practice in deserts of Iran and in some farms camels are raised with cows, sheep and goats for its milk and meat. There is a need for more research on viral camel diseases in Iran, with special emphasis on diagnosis and control.

Keywords: *Iran, Non-pathogenic viral infections, Camel*

EFFECT OF *ALHAGI MAURORUM* PLANT ON FEED INTAKE AND NUTRIENTS DIGESTIBILITY IN DROMEDARY CAMEL

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ABSTRACT

The leguminous plant *Alhagi Maurorum* (camelthorn) is widely found in the original habitats of the old world camelids, from Mediterranean to the Russia. Given the name of camelthorn, it is one of the feeds of choice to camels because of its richness in crude protein, especially when it is full of legumes. It is not only liked by camels but also very nutritious and support the intake and digestion of other roughages. This study was therefore designed to evaluate the effect of *Alhagi maurorum* on overall feed intake and nutrients digestibility in dromedary camel. A total number of 4 female camels (average age 5 years; average body weight 320 kg) fed with experimental diets for one month. Diets were included control; 60% wheat straw+40% alfalfa and test diet containing of 60% wheat straw+40% *Alhagi maurorum*. Feed intake and nutrients digestibility of camels were measured. Results showed that camels fed with *Alhagi maurorum* had higher dry matter intake than control diet ($P<0.05$). Digestibility of dry matter (57.4 and 51.5 %) and neutral detergent fiber (42.6 and 36.2 %) in camels fed with *Alhagi maurorum* diet was higher than control diet ($P<0.05$). But digestibility of acid detergent fibre and crude protein between treatments was not different ($P>0.05$). For gut pH of camels was not influenced by experimental diets ($P>0.05$). The result of the current study revealed that feeding *Alhagi maurorum* plant to the dromedary camels improved feed intake and digestibility; therefore, *Alhagi maurorum* plant is recommended to be used as an alternative for forage in dromedary camel's diet.

Keywords: *Alhagi maurorum*, Nutrients digestibility, Camel

COMPARATIVE STUDY OF CAMEL POPULATION AND STATUS IN GREATER AND LESSER CHOLISTAN DESERT, PAKISTAN

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ABSTRACT

The Cholistan Desert rangelands, also known as Rohi, are located in the districts of Bahawalpur, Bhawalnagar and Rahim Yar Khan, which covers about 2.7 million hectares of land. The people of Cholistan raise camels to fulfill their food, transport and financial needs. Beside personal use, these people sale camel milk and live animals to cope their financial needs. In present study, the duration of data collection was 12 weeks, and the representative families at household level were selected for Focused Group Discussion (FGDs) through a semi-structured questionnaire from 24 randomly selected Tobas. Total 384 households were interviewed through the questionnaire, comprising of 176 from the Lesser Cholistan (LC), and 208 from the Greater Cholistan (GC). Results showed that the camel population was significantly higher in LC (527) as compared to GC (499). In LC, the camel milk peak production (liters/animal/day) and total milk production at household (liters/day) was also more than that of GC. Total camels' birth was non-significantly higher in LC (99) as compared to GC (95). At household level, the mortality of camels was non-significantly lower in LC (4) as compared to GC (5). Similar camel's mortality results were also observed at the Toba level. In conclusion, because of easy access to the local market, camel population was higher in LC as compared to GC however, the large grazing area in GC and the mobility pattern changes across the year affected camel population of both of these areas.

Keywords: *Desert, Cholistan, Focal group discussion, camels, Husbandry practices*

CAMEL REARING IN KENYA- A CASE STUDY

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ABSTRACT

We are newcomers in the camel keeping world, having inherited my father's herd of 250 much loved camels only ten years ago. He had bought his first camel in 1975, when I was a teenager, soon after taking up land in ranching country in Laikipia, Kenya. Before that there were no camels in this area. So, it has been almost a lifetime of sometimes exciting, sometimes distressing, but always interesting, learning experiences. Our ranch is a made up of plains of savanna grassland, on a mixture of red and black cotton soils, and thick Acacia-Euclea bushland, mostly on lava escarpments. We learned that during the rainy season the bush we have here has done a maximum of 500 camels well. However, we also learnt that they get a lot of thorns in their softened soles when the soil turns to thick, slippery mud. This causes many consequent problems. And many a camel has been lost from slipping off rocks when they're wet. We have also found recently that we were losing up to 75% of our new-born calves that drop to coincide with the heavy rains. So, we built a camel "parlor" to house the new mothers and their calves. It was also realized due to lack of proper colostrum feeding, losing more calf due to diarrhea within a month of birth. So, first colostrum fed within two hours of birth, and then make sure it suckles regularly. By interfering in the natural order of nature that allows only the fittest to survive for desert conditions, we have turned the survival rate of calves around to 75% survivors. The other problem that materialized with the more erratic rain patterns was a shortage of Selenium. At one stage we were losing an average of a camel a week. So extra selenium is now given to the pregnant cows and new-born calves. Trypanosomiasis had also become a problem with the wetter and bushier changes, and this caused many abortions. Prophylactic treatment is also now given to the pregnant cows twice during their pregnancy. Tick burden lessened by dipping camels. Alternating with heavier rains we have been experiencing longer dry periods. The leaf from the Acacias dropped off during these times and they were left with, primarily, perennial bush with high tannin contents. The camels then suffered from fatal ketosis unless supplemented. Ranching with lions has created many challenges, and many losses, particularly as numbers of wildlife gradually dwindle. My father imported high yielding milk camels from Pakistan in the mid-1990s with an intention to increase the milk yields in his own herds, as well as in the Kenya breeds. Today we benefit from this crossbreeding with strong camels mixed with higher yields of milk that we sell from the farm gate to the increasingly diverse group of people realizing the benefits of camel milk. Records have been kept for the Ol Maisor camel herds since the first camel, Fred, arrived on the ranch in 1975. It has been immensely helpful in our understanding of what we are trying to do, lacking the innate knowledge born to the traditional camel keepers of the world. This is in how to keep camels as a ranch animal.

Keywords: *Kenya, Camel keeping, Ranch, Rains, Cross breeding*

PREVALANCE OF MASTITIS IN LASSI CAMELS, BALOCHISTAN, PAKISTAN

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ABSTRACT

Mastitis causes inflammation of mammary gland. In terms of economic losses, it is most expensive disease. Mastitis is a worldwide issue which affects the milking animals at any stage of life. Mainly it is caused by bacterial organisms. Considering its importance, this study planned to know the mastitis and its mastitogens in Lassi camel cows in Lasbela region, Pakistan. For this purpose, milk samples (n=100) were randomly collected from different areas of the Lasbela region. Milk strips (2-3) from each quarter were drawn to know any presence of pus, blood clots, flakes and change in color. For knowing sub-clinical mastitis, surf field mastitis test was used. Positive milk samples were kept immediately in an icebox cooler and transported to lab. Primarily, each milk sample was cultured on nutrient agar by spread out technique. Mannitol salt agar medium was used to detect the presence of *Staphylococcus aureus* and multiple streaking was applied to isolate the bacteria. Microscopic morphology, staining methods and biochemical testing of bacterial isolates were identified on the basis of culture characters. Results showed 43% prevalence of mastitis in Lassi camels. Further in different age groups; 4-7 years, 7-10 years and above 10 years, the prevalence was 38%, 41.18%, and 47.5%, respectively. In case of milking frequency, the animals milked once daily showed 46.67% mastitis as compared to 10% mastitis in animals daily milked more than once. In satisfactory and non-satisfactory udder hygiene conditions, the prevalence was 8% and 50%, respectively. It was also found that the most common bacterial pathogens involved in Lasi camel cow mastitis were *Staphylococcus aureus* followed by *Streptococcus agalactiea* and *Streptococcus dysagalctiea*.

Keywords: *Lassi camel, Mastitis, Prevalence, pathogens, age groups*

PREVALANCE OF TRYPNOSOMIASIS IN CAMEL BREEDS OF LASBELA REGION, BALOCHISTAN USING DIFFERENT DIAGNOSTIC TECHNIQUES

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ABSTRACT

Trypanosomiasis is the most significant disease of camels across the globe. It causes huge economic as well as animal health losses in Pakistan. Trypanosomiasis is commonly caused by *Trypanosoma evansi*; however other *Trypanosoma* species can also produce the disease but have not been reported in Pakistan, yet. The outbreaks and prevalence of the disease is still not documented in Baluchistan province. This study designed to know the prevalence of trypanosomiasis in camel breeds of Lasbela region using different diagnostic techniques. For this purpose, samples (n=100; 27 male and 73 female) collected from three different areas of Lasbela district. For microscopic study 0.2 ml blood was collected from ear vein and for molecular examination 5 ml blood was collected from jugular vein. The PCR based prevalence was found to be 20%. Two cases were recognized microscopically and 5 were confirmed by PCR examination. It was found that PCR has much higher diagnostic sensitivity than the conventional microscopic examination. It improves the species specificity in diagnosis of trypanosomiasis compared to microscopic examination. Further, the infection was more prevalent in the adult camels than the younger and the infection was more prevalent in Lassi breed compared to Makrani breed. Further, camel husbandry practices were also recorded using questionnaire. Results showed that all farmers were uneducated, most of the farmers had dependency for their livelihoods on livestock and agriculture business. More than 70% farmers kept local breed. All of them practiced pasture-based farming system. Flies burden were high in summer season and they neither applied any flies control measure nor any veterinary team ever visited their farm.

Keywords: *Trypanosomiasis, Laasi, Makrani, Lasbela, Prevalence, PCR*

LASSI CAMEL HABITAT: SOCIAL STATUS OF CAMEL FARMERS AND CAMEL HUSBANDRY PRACTICES

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ABSTRACT

In this study, Lassi camel habitat was surveyed and Lassi camel farmers (n=100) were interviewed using questionnaire. Results showed that Lassi camel farmers were living in ultra-low-level social conditions. Residences were being used however, all of them (100%) were mud houses. Primary level schools were available to 38 %. Electricity, gas and tap water were not available (100%). In case of literacy level, all interviewed farmers were found illiterate (100%). Average monthly income of 40% of the Lassi camel farmers ranged from 15000-20000 rupees whilst 28% were getting more than 25000 PKR. In total family income of camel farmers, 39% families earned their 50-70% income source from camel farming whilst 26% families earned more than 70% income source from camel husbandry. In livestock production systems, only extensive system based on grazing (100%) was recorded in camel husbandry practices. Number of camels kept by families varied; 1-5 camels were kept by 37% camel farmers, 6-10 camels by 12%, 11-15 camels by 32%, 16-20 by 5% whilst more than 20 camels/family were kept by 14% Lassi camel farmers. All camels were used for home purpose (100%). Weekly camel market exists in 'Lakhra' where buyers buy it mostly for meat purposes. Average price of adult he-camel is 150000 (93%) whilst average price of adult she-camel ranged from 75-80000 PKR. Average price of male young stock is up to 40000 (94%) whilst female young stock is sold at 30000 PKR. In case of camel products, meat market is available (100%) whilst milk market is deficient (100%). Grazing (herbs, shrubs, trees and grasses) serves as main feed resource for Lassi camels. Very rare feeding of crop residues and concentrate is practiced (0.5%). Feeding practice of collected fodder was also deficient (0.5%). Camels do travel up to 5 km for grazing (93%). It was concluded that Lassi camel farmers were living poverty ridden life whilst their camel husbandry practices were conventional which if improved can bring positive change in their living standards.

Keywords: *Lassi camel, Lasbela, Social status, Production system, Marketing*



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