

Isolation and identification of ectoparasites in single humped camels (*Camelus dromedarius*) of Cholistan area, Pakistan

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Abstract

Thirty herds comprising four hundred and fifty camels (*Camelus dromedarius*) ranging from 5 months to 17 years of age were subjected to external examination of ectoparasites (ticks, mange mites and flies) during November 2010 to July 2011 at Cholistan, Bahawalpur, Pakistan. An overall prevalence of Ectoparasites was 55.55%. Ticks were the most frequent ectoparasites harboring on dromedaries. The ticks in order of their infestations were; *Rhipicephalus spp* (28.95%) *Hyalomma dromedarii* (26.48%), *Dermacentor spp* (18.29%) *H. anatolicum* (12.47%), *H. marginatum* (6.69%), *Ornithodoros spp.* (4.89%) and *Amblyomma variegatum* (2.20%). The *Sarcoptes scabiei var. cameli* (42.22%) was identified as most dominant mange mite. 40.88% camels were infested with two species of dipterans i.e.; *Chrysomya spp.* (10%) and *Wohlfahrtia magnifica* (16.67%) which are most frequently causing preputial and vaginal myiasis. *Cephalopina titilator* fly (1.11%) was found to cause camel nasal myiasis. The district wise prevalence was as Rahim Yar Khan (60.87%), followed by Bahawalnagar (49.75%) and Bahawalpur (41.05%). The tick load per animal was higher during summer especially in July (64.52%) followed by the lowest ticks load during December (25.58%). The infestation of ectoparasites was higher (69.53%) in camels ranging the age from 5-7 year however the lowest infestation (23.08%) was noted in camels less than one year of age.

Keywords: Ectoparasites, Cholistan desert, Camel, *Hyalomma spp.*, Pakistan

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عزل وتشخيص الطفيليات الخارجية في الجمال وحيدة السنام (*Camelus dromedarius*) في كولستان، باكستان

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الخلاصة

تم فحص 450 جملا من ثلاثون قطيعا من الجمال وحيدة السنام *Camelus dromedaries* باعمار تراوحت بين 5 اشهر الى 17 سنة للتحري عن الطفيليات الخارجية (القراد، حلم الجرب والذباب) خلال الفترة الممتدة من تشرين 2010 الى تموز 2011 في مقاطعة كولستان - بهالابور - باكستان. بلغت النسبة الكلية للطفيليات الخارجية 55,55%. كان القراد الاكثر تسجيلا من بين الطفيليات الخارجية في الجمال وبلغت نسب تسجيل انواعه تنازليا كالآتي *Rhipicephalus spp* (28.95%), *Hyalomma dromedarii* (26.48%), *Dermacentor spp* (18.29%), *H. anatolicum* (12.47%), *H. marginatum* (6.69%), *Ornithodoros spp* (4.89%) و *Amblyomma variegatum* (2.20%). اما حلم الجرب من نوع *Sarcoptes scabiei var. cameli* فقد شخصت بنسبة (42,22%) كأكثر انواع الحلم تواجدا. سجلت نسبة خمج بنسبة 40,88% في الجمال بنوعين من ذباب ثنائية الاجنحة من نوع *Chrysomya spp*. وبنسبة (10%) ونوع *Wohlfahrtia magnifica* بنسبة (16,67%) وهي الاغلب التي تؤدي الى النغف في القلف والمهبل. اما ذبابة

Cephalopina titilator فوجدت بنسبة (1,11%) والتي سببت نغف الانف في الجمال. ان نسب انتشار الطفيليات الخارجية وحسب المناطق كانت كالآتي: رحيم يارخان (60,87%) تبعها في ولنجار بنسبة (49,75%) ثم في بها لابور بنسبة (41,05%). ازدادت الاصابة بالقراد خلال الصيف وخاصة في شهر تموز اذ سجلت بنسبة (64,52%) والاقبل خلال ايلول (25,58%). وفيما يخص الاعمار فقد سجلت اعلى النسب (69,53%) في الاعمار بين 5 – 7 سنوات واقلها (23,08%) في الجمال باعمار اقل من سنه واحدة.

Introduction

In Cholistan desert, camel is the best adopted animal, a hope of life for nomads. It provides milk, meat, leather and is used for transportation, entertainment like dancing and racing (1). The camel is capable of enduring thirst and hunger for days and plays a pivotal role in the socioeconomic uplift of the community of cholistan desert (2). Many pastoral groups and communities are solely depending on camels in diverse ecozones throughout the world, the nomads are depending on camels for their livelihood (5) in the wide deserted less rainfall area makes the life scare in drinkable sweat water. Sweet water in Cholistan is collected in natural depressions or manmade ponds called "Tobas" during the rainy season (6). There are 598 Tobas in Cholistan, which are primary sources of water for survival and for Livestock as well as human beings (7). In cholistan, life is difficult but it still nurtures certain ectoparasites which are best adapted to harsh season. Ticks are one of the most important ectoparasites of camel. It serves as a vector to numerous pathogens including protozoans (Trypanosomiasis), rickettsiae (ehrlichiosis), viruses (e.g., Foot and mouth Disease), bacteria (e.g., *Pasteurella spp*, *Brucella*, *Listeria spp* and *Staphylococcus*) and spirochetes (11). One of the drawback of Tick infestations is not only it lower the production of animals but can also plays a vector role (8). These diseases are mostly confined to tropical and subtropical countries especially India, Pakistan and Bangladesh, where climatic conditions are conducive for the growth and development of many tick species (9). In these countries, situation is further deteriorated due to lack of proper management practices (10). Blood is a vital fluid for host as well as for the ticks; blood loss causes functional impairment in the camels and even heavily infested camels are retarded, thin, weak and stunted. Productions factors like milk yield are greatly reduced. Economic losses up to 20-30% are due to depreciation of the value of skins and hides (11-13). Ghosh *et al.* (9) have reviewed effective tick control strategies and methods in camels (14). Other common skin problems in camels are due to ecto-parasites like sarcoptic mange mainly caused by *Sarcoptes scabiei var. cameli*; a threatening and serious health hazard in Cholistan. Mange lesions vary with season, region nutritional status, age and other predisposing factors (15). Transmission of agents of disease is reported by direct contact or through infected fomites (trees, blankets and baggage). Myiasis in camels is

reported worldwide (16). Flea (order Siphonaptera) infestations are also described as a major parasitic problem of animals (17). Although reports on flea infestations in camels are frequent and they are unusual on livestock farms (18). The mange caused by *Psoroptes cameli* has mild and superficial infestation on skin with varying degrees of pruritis in camels. The present investigation was designed to record the prevalence and infestation of ectoparasites like ticks, mange and myiasis infestation in one humped camels (*Camelus dromedarius*) in three various agro-ecological sites including Rahim Yar Khan, Bahawalnagar and Bahawalpur of Cholistan desert situated in Pakistan.

Materials and methods

Geo-location of study

The research was carried out in three agro-ecological sites including Rahim Yar Khan, Bahawalnagar and Bahawalpur of Cholistan desert located in Pakistan at latitudes 27°42' and 29°45' North and longitudes 69°52' and 75°24' East at 112m above the sea level.

Meteorological study

The climate of this area is arid, harsh, hot subtropical. In monsoonal the average annual rainfall is 180 mm that is very inconsistent both in quantity and duration with prolonged droughts that are common after every 10 years interval causing famine and drought. The mean annual temperature is 28.33°C except in June being the hottest exceeds 45°C (2).

The selection of study animals

This study was sprawled on 450 clinically healthy one-humped camels (*Camelus dromedarius*) ranging from 5 months age to 17 years of age. All the animals were raised by local farmers and usual fed low quality diets contained mainly straw, barley, shrubs and wilted grass spread in the area. The animals under study were examined for the presence of ecto-parasites from November 2010 to July 2011 irrespective of their breed, sex and age. Thirty tobas (10 from each district) were selected on the basis of simple proportionate sampling method as described by Thrusfield, 1995 and the minimum distance between each toba was 10 km approximately. The data was collected on the prescribed Performa containing information about the daily aggregation of camels on drinking spot, selection of shrubs and routes for usual travel. The samples of ectoparasites

were brought to the laboratories of Parasitology, Department of Pathobiology, Faculty of Veterinary Sciences, Bahauddin Zakariya University, Multan, The samples of shrubs were brought to the parasitology laboratory, College of Veterinary and Animal Sciences, CVAS, UVAS, Jhang campus, Pakistan.

Collection and identification procedures of ectoparasites

Collection of ectoparasites

Ticks were collected (without damage to their mouth parts with forceps) from infested camels (19). The collected ticks were stored and preserved in glass vessel containing 70% alcohol and 5% glycerol. Tick collection was performed during dusk and dawn from the skin of the animals. The containers were labeled individually with the date and place of collection. The information were collected and data was recorded on the prescribed Performa included the predilection site of the ticks (head, neck, shoulder, back, udder, urogenital area, flanks, front and hind legs), ethno veterinary remedies adopted by the camel farmers and usual shrubs adopted for eating by the camels and frequency of camels aggregation.

Deep skin scraping was performed in affected animals with the help of scalpel blade after the disinfection of the area for the presence of mange mite infestation (20). The mange mites from the different body regions including; head, neck, flanks, front and hind legs, and belly were placed separately in white blotting paper (21).

Identification of ectoparasites

The collected ectoparasites (ticks, mange mite and flies) were identified accordingly as Wall and Shearer (21) and Walker et al. (22). The skin and hide of all camels under study were thoroughly examined for the presence of ectoparasite lesions especially the area on face, neck, inguinal region, sides of the body and around the tail. The confirmation of mange mite was concluded by microscopic examinations of skin scrapings after 10% KOH digestion method on the basis of morphological characteristics as described (23-25).

Collection of Litter for the presence of larvae

The Litter samples from a depth of 4, 8, 12, and 16 cm were collected from the fence areas of infested camels to investigate the presence of larval stages of the ectoparasites, if any.

Statistical Analysis

The data collected for the prevalence of ectoparasites in camels were analyzed by using Interceded STATA (Version 7) software. The Chi-square (X^2) test was used to assess differences in the prevalence and frequency of ectoparasites among study areas, sex, month of the year and age groups. In all cases, 95% confidence intervals and

$P < 0.05$ were set for significance (26).

Results and discussion

Over all prevalence of ectoparasites

Overall prevalence of ectoparasites including ticks, mange and myiasis was recorded 55.56% during the current study (Table 1).

Table 1: Comparison of mean prevalence of ectoparasites in camels at various *tobas* of Cholistan

Study Area	No. of camels Examined	No. of infested camels	Over all % of prevalence of infected animals on <i>tobas</i>
Bahu wala Toba	12	8	66.67
Bai Lah Wala Tibba	20	9	45.00
Bhai Khan	14	8	57.14
Bhuddi Wali Khui	21	9	42.86
Bijnor Fort	11	7	63.64
Channan Pir Wala	15	8	53.33
Cheepan Wala Toba	16	9	56.25
Derawar Fort	14	7	50.00
Din Garh Fort	17	8	47.06
Dosste Wala Toba	19	9	47.37
Gadhen Wala Toba	21	15	71.43
Islam Gargh	16	6	37.50
Jam Sar,	11	8	72.73
Khaitran Wala Toba	12	9	75.00
Khanu wala toba	12	7	58.33
Khiwatal Wala Toba	19	11	57.89
Khokhran Wala Toba1	15	10	66.67
Khokhran Wala Toba2	13	6	46.15
Lunja wala toba	18	7	38.89
Masu Wala Toba	16	8	50.00
Moujgarh Fort	9	6	66.67
Noor Sar toba,	12	8	66.67
Dolu toba	13	6	46.15
Noora wala toba	18	12	66.67
Roda Wala Toba	15	9	60.00
Sar wala toba	16	8	50.00
Shaheedan Wala Toba	14	6	42.86
Sohaib Wala.	13	8	61.54
Sulleh Wala Toba	13	7	53.85
Taraway Wala Toba,	15	11	73.33
Total	450	250	55.56

$X^2 = 21.10$, P – value = 0.855 (No significant variation was observed in the prevalence of ectoparasites among various study sites except higher prevalence of ectoparasites infestation in *toba* number 11,13 and 14) as in Graph 1.

Identification of the ticks

A total of 7720 ticks were recovered from 450 infested animals. Seven species of ticks in order of their prevalence were identified as *Rhipicephalus* spp. (*R. pulchellus*), *Dermacentor* spp. *Hyalomma* spp. (*H. anatolicum*, *H. marginatum*, *H. dromedarii*), *Ornithodoros* and *Amblyoma* (*A. variegatum*). A total of 2235 (28.95%) of *Rhipicephalus* spp., 2045 (26.48%) of *Hyalomma dromedarii*, 1412 (18.29%) of *Dermacentor* sp, 963 (12.47%) of *Hyalomma anatolicum*, 517 (6.69%) of *Hyalomma marginatum*, 378 (4.89%) of *Ornithodoros* and 170 (2.20%) of *Amblyomma variegatum* were observed during the study. Dinka et al. (27) reported three tick species; *Amblyomma gemma* (15.10%), *Hyalomma dromedarii* (15.36%) and *Rhipicephalus pulchellus* (27.86%) from Nigeria (27) were reported while in Iran especially in Northeast Province of Khorasan the ticks like *Hyalomma dromedarii* (90.7%) is a dominant species (34) that is in consistent with our study. It indicates that there is a wide range of ticks' species that causes manifestation in camel in different parts of the world (28,29) but *Hyalomma dromedarii* is present in African and Asian countries equally in Iran also.

Three species of flies were found infesting one hundred and eighty four (40.88%) camels i.e; *Chrysomya* spp. (10%), *Wohlfahrtia magnifica* (16.67%) and *Cephalopina titillator* fly (1.11%) was found to cause nasal myiasis in camel while other causes vaginal and preputial myiasis. Oryan, et al. (31) reported contrast results for Nasal myiasis Seven hundred and seventy one camels (58.1%) were infested with this larvae and the rate of infestation was significantly greater in the colder months (69.8%) compared to those of warmer months (36.2%). In male camels the ectoparasitic infestation was 49.55% as compared to those of the female camels (57.2%). The prevalence rate was lower in camels younger than 1 year old (23.08%) compared to those of 3-5 (55.26%) and over 5-7 years old (69.53%) also reported by Tesfahyet and Onu (30). A total of thirty *tobas* (10 from each district) were investigated in which gleaned that all *tobas* were found to be infested due to visit of infested camels. The highest prevalence as described in Table 1, 2, 3 and 4, the 75% was observed at Khitran wala toba, while the lowest 37.5% at Toba Islam Gargh. The district wise prevalence revealed highest incidence at Rahim Yar Khan (60.87%), followed by Bahawalnagar (49.75%) and Bahawalpur (41.05%). The present study reports that the prevalence of ectoparasites in relation to different study sites and sex ($P>0.05$) in not significantly different. This shows that the management and environmental conditions for the propagation of ectoparasites is almost similar throughout the Cholistan desert. However, highly significant difference ($P>0.05$) was observed statistically among various age groups as well as during different months of the year. It indicates that

immunity titer varies during different ages and climatic conditions of the different months play vital role for the ectoparasites infestation. Regarding the age groups the prevalence was higher (69.53%) in animals between 5 to 7 years of age while lowest was observed in less than one year of age (23.08%) as shown in Figure 1, 2, 3 and 4 and also in Graph 4. Statistically there was no effect of sex ($P>0.05$) on prevalence and severity of ectoparasites, however, high humidity and temperature have significant role in the propagation of diseases. During summer highest numbers of infective larvae were found that are directly responsible for the occurrence of disease. Demodectic mange was diagnosed in 58.2% of camels ranged in 5-10 years old & 16.4% of camels more than 10 years old and 25.4% in camels less than 5 years old which indicate the high incidence in camels aged in 5-10 years (31). Our results are in agreement with Hussain *et al.* (32) but they have studied only mange while we have studied collectively all the ectoparasites including ticks, fleas, flies, mange and mite infestation in camels (31). Lawal *et al.* (33) reported 91.26% ticks, 4.63% flies, 3.54% mites and 0.55% lice respectively (32). The prevalence of infestation from September to March that is identical to the cold seasons (autumn and winter) in this country was significantly higher (69.9%) than warm seasons (36.0%) ($P<0.05$). The rate of infestation was significantly higher in females (57.2%) compared to those of male animals (49.55%) ($P<0.05$). The prevalence of infestation was also significantly higher in young animals of age ranging 3-5 years (55.26%) and older than 5-7 years of age groups (69.53%) compared to those of less than 1-3 years old animals ($P<0.05$). The tick load per animal was found higher during summer months (May & July) than during winter months (February). The lowest ticks load was gleaned during December (25.58%), whereas the highest was recorded in July (64.52%) (33). The reason might be frequent huddling of the winter months and higher humidity levels and perspiration of animals during warmer months. The contaminated clothing used may be another factor.

Table 2: Sex wise Comparison of mean prevalence of ectoparasites on camels

Sex wise distribution	No. of Examined camels	No. of infested camels	% prevalence of ectoparasites on camels
Male	111	55	49.55
Female	339	195	57.52
Total	450	250	55.56

$X^2=0.1423$, P – value = 0.9288 (No significant difference was observed statistically in the prevalence of ectoparasites between different sex groups) however female camels were infested higher up to 57.52% as shown in Graph 2.

Table 3: Month wise Comparison of mean prevalence of ectoparasites in camels

Months	No. of camels Examined	No. of infested camels	% prevalence of ectoparasitic infected animals
November,2010	55	25	45.45
December,2010	43	11	25.58
January,2011	65	39	60.00
February,2011	78	48	61.54
March,2011	25	14	56.00
April,2011	48	29	60.42
May,2011	35	22	62.86
June,2011	39	22	56.41
July,2011	62	40	64.52
Total	450	250	55.56

$\chi^2 = 22.81$, P – value = 0.004 (Significant difference was observed in the prevalence of ectoparasites during different months of the year but the most activity of the ectoparasites were recorded during February, May and July months).

Table 4: Age wise Comparison of prevalence of ectoparasites in camels

Age	No. of camels Examined	No. of infested camels	Over all % prevalence of infected animals
Less than 1 year	26	6	23.08
Between 1 to 3 Years	99	48	48.48
Between 3 to 5 Years	152	84	55.26
Between 5 to 7 Years	128	89	69.53
More than 7 Years	45	23	51.11
Total	450	250	55.56

$\chi^2 = 23.629$, P – value = 0.005 (Highly significant difference was observed in the prevalence of ectoparasites among different age groups but the higher prevalence was observed between the age groups from 3-7 years) as shown in Graph 3.

In conclusion, the major tick species is *Rhipicephalus spp.* Infestations appeared to be associated with adverse environmental and managerial conditions present in the study area. In cholistan camels acquire one or more ectoparasites (Ticks and Mange Infestation) in almost all seasons. The most workable plan adopted by the nomads is the manual detachment of ticks from skin. Use of tick repellents on skin or clothing, as directed on the product label, is another important preventive measure for people who enter tick-infested habitats along with ethnoveterinary formulations.



Figure 1: presence /attachment of Ticks at the udder region of a Female Camel.



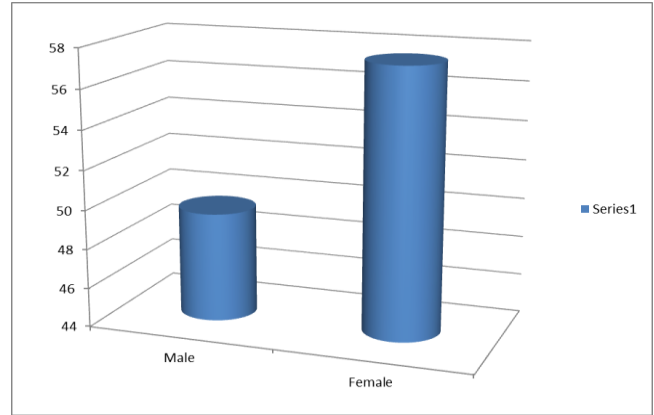
Figure 2: Skin patches due to Mange infestation on the body of a Camel as reservoir.



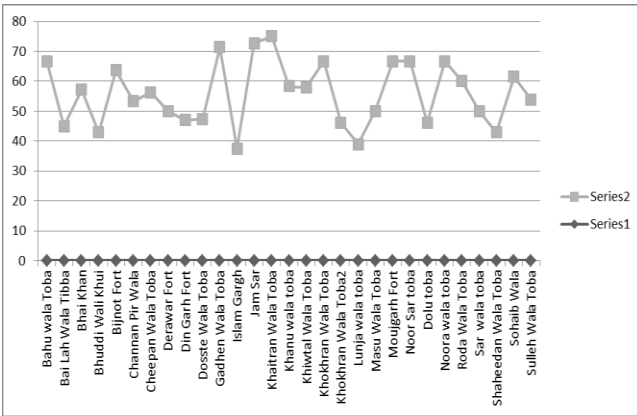
Figure 3: Ticks infestation on the abdomen wall of a Camel; a common site of contact.



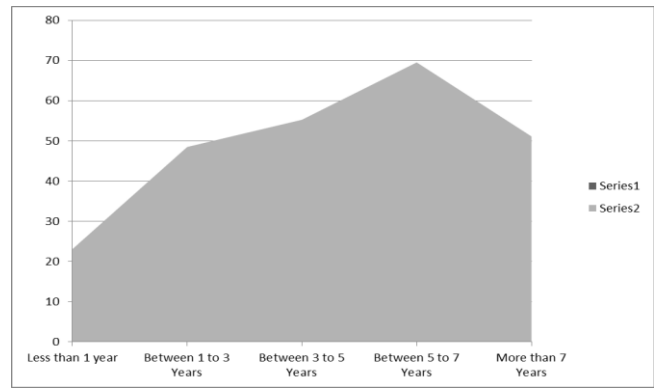
Figure 4: Camels dealing with common shrubs of the area, a natural inhabitants in cholistan.



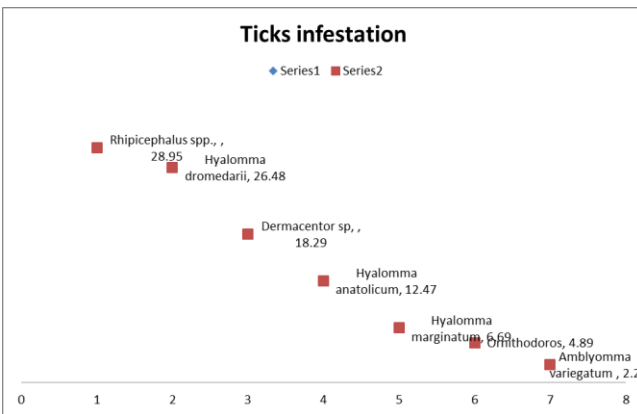
Graph 3: Preference of ectoparasites in sex-wise ratio in camels.



Graph 1: Comparison of mean prevalence of ectoparasites in camels at various tobas of Cholistan.



Graph 4: Age-wise prevalence and infestation of ectoparasites.



Graph 2: Ticks infestation in accordance if prevalence.

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