

Occurrence of gastrointestinal helminths in Bactrian camel in Iran

Tajik, J.^{1*}, Moghaddar, N.², Nikjou, D.³ and Taleban, Y.⁴

¹ Department of Clinical Sciences, School of Veterinary Medicine, Shiraz University, Shiraz, Iran;

² Department of Pathobiology, School of Veterinary Medicine, Shiraz University, Shiraz, Iran;

³ Department of Clinical Sciences, School of Veterinary Medicine, Tehran University, Tehran, Iran;

⁴ Private Practitioner, Shiraz, Iran

* Corresponding author email: tajik@shirazu.ac.ir

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Abstract. A study on naturally acquired gastrointestinal helminthic parasites in Bactrian camel was carried out in Ardabil province, northwest of Iran, which is the main site of this species in Iran. This species has importance in Iran due to its low population. A total of 25 faecal samples (25% of population) were examined by Clayton Lane method to determine the egg count of different types of helminths in different age groups. Helminth eggs were found in 13 (52%) of the faecal samples (0-191 eggs/gm, 51.96±13.82). Bactrian camels were infected with *Nematodirus* sp. (32%), *Trichuris* sp. (32%), *Marshallagia* sp. (28%), *Moniezia* sp. (28%) and *Strongyloides* sp. (16%). The age of the infected Bactrian camels was significantly higher than the non-infected camels ($p<0.01$) and there was a significant correlation between age and the intensity of infection ($r=0.583$, $p=0.002$). No significant difference in the ratio of the affected camels and in the intensity of infection was found between the two sexes. The results of the current study showed that helminthic infection is a serious problem in this animal in Iran.

INTRODUCTION

Although the Bactrian camel was domesticated on the eastern border of the Caspian sea around 2500 B.C. and then has migrated to other countries, the population of this species in Iran is threatened with extinction. Their number has been estimated up to 100 (Niasari-Naslaji *et al.*, 2008). Ardabil province, northwest of Iran, is the main and maybe the only site of this species in Iran. The Bactrian camel is well-adapted to harsh climate conditions (Zongping, 2003) and has a high economic value by providing meat, milk and wool as well as transportation and labor for local farmers. However, there is little information about this valuable species in Iran.

Parasitism has been introduced as one of the major problems affecting the

productivity and performance of camels (Anwar & Khan, 1994). Although gastrointestinal helminths cause injury to their hosts through a wide variety of mechanisms, mainly reduction in voluntary food intake, loss of productivity and diarrhoea, subclinical and asymptomatic helminthiasis causes a decrease in the performance of animals without notable clinical manifestation (Borji *et al.*, 2010). It has been suggested that regular anthelmintic treatment increases the productivity of camels (Ballweber, 2009). The study of the parasite species occurring in a host is of paramount importance for planning an efficient control programme and to prevent economic loss due to parasitic infection.

To the best of our knowledge, there is no information about the gastrointestinal parasites of the Bactrian camel in Iran. Therefore, this study was undertaken to

provide information about the type of helminthic infections and their prevalence rates in Bactrian camel in Iran.

MATERIALS AND METHODS

The investigation was carried out on pure two humped camels (*Camelus bactrianus*) from different parts of Ardabil province which were referred to the Bactrian camel research center, Jahadabad, Meshginshahr, Ardabil, during the rutting season, from February to March 2009. Camels were of both sexes, with different ages and had no anthelmintic treatment in the previous year.

After clinical examination, faecal samples were collected directly from the rectum of 25 clinically healthy two humped camels and each sample was placed in a faecal container. The samples were transported to the laboratory in an ice box.

Faecal egg counts (egg per gram of faeces: EPG) were determined by the Clayton Lane technique. In each case to assess the level of infection, 3 gram of faeces was mixed in 42 ml of saturated solution of sucrose as the floating medium and the number of helminth eggs per gram of faeces was obtained by multiplying the total number of eggs counted in the two squares of the counting chambers of the McMaster slide by the dilution factor (Anon, 1977). Helminth eggs present were identified using standard parasitological criteria (Anon, 1977; Soulsby, 1982).

Statistical analysis was performed using SPSS12 (Illinois, Chicago). The Chi-square test was used for comparison of the infection rate between the two sexes. Comparison of the infection rate between the age groups was performed using Fisher's exact tests. Two sample t-tests were used to detect differences in the age and EPG between the two sexes. Correlation of the EPG and age was analyzed by Pearson's correlation test. Analysis of variance (ANOVA) test was used to compare the EPG between the different age groups of two humped camels. Differences were considered significant at $p < 0.05$.

RESULTS

Overall, 12 male and 13 female camels were sampled and 13 cases (52%) were found positive for different types of helminths eggs in their faeces. Eleven faecal samples had more than one parasite (Table 1). The nematode eggs recovered from the camels belonged to *Nematodirus* sp., *Strongyloides* sp., *Trichuris* sp., *Marshallagia* sp., genus of intestinal worms in the family Trichostrongylidae. Also, *Moniezia* sp. (a genus of tapeworm) eggs were observed in samples from seven camels.

Mean EPG was 51.96 ± 13.82 (0-191 eggs/gm). The average ages (mean \pm SEM) of the male and female camels were 7.5 ± 1.76 and 8.57 ± 1.18 years, respectively. There were no significant differences between male and female camels in the age, infection rate and the severity of infection (EPG).

The average ages (mean \pm SEM) of the infected and non-infected camels were 11.54 ± 1.17 and 4.29 ± 0.84 years, respectively. The age of the infected camels was significantly more than the non-infected camels ($p < 0.01$) and there was a significant correlation between age and the severity of the infection ($r = 0.583$, $p = 0.002$). The type and prevalence of helminths recovered from the sampled camels are given in Table 2.

Camels were divided into three groups according to their age as, $G_1 < 2$ years, $G_2: > 2$ and < 5 , and $G_3 > 5$ years. In the G_1 group, consisting of 4 camels, none of the sampled camels was infected. In the G_2 group, which consisted of 5 camels, one camel was infected. In the G_3 group, which consisted of 16 camels, parasite eggs were recovered from 12 camels. The infection rate of the G_3 group was significantly higher than the G_1 and G_2 groups ($p = 0.014$ and $p = 0.47$, respectively).

DISCUSSION

The available information about helminthes in camel in Iran consist of a few studies that have been conducted on gastrointestinal helminths of dromedary camels and, to the

Table 1. The prevalence of gastrointestinal helminthes, mean EPG and recovered eggs according to different sexes and age groups in Iranian Bactrian camel (*Camelus bactrianus*)

	The number of camels	The number of infected camels (%)	Mean EPG	Recovered eggs (Genus)
All sampled camels	25	13 (52)	51.96±13.82	<i>Nematodirus</i> sp., <i>Strongyloides</i> sp., <i>Trichuris</i> sp., <i>Marshallagia</i> sp. and <i>Moniezia</i> sp.
Male camels	12	6 (50)	44.66±18.73	<i>Nematodirus</i> sp., <i>Strongyloides</i> sp., <i>Trichuris</i> sp., <i>Marshallagia</i> sp. and <i>Moniezia</i> sp.
Female camels	13	7 (53.8)	58.7±20.7	<i>Nematodirus</i> sp., <i>Trichuris</i> sp., <i>Marshallagia</i> sp. and <i>Moniezia</i> sp.
G ₁ (<2 years)	4	0 (0)	—	—
G ₂ (2 years< and 5 years<)	5	1 (20)	3	<i>Nematodirus</i> sp., <i>Strongyloides</i> sp., <i>Trichuris</i> sp.
G ₃ (>5years)	16	12 (75)	72.75±18.16	<i>Nematodirus</i> sp., <i>Strongyloides</i> sp., <i>Trichuris</i> sp., <i>Marshallagia</i> sp. and <i>Moniezia</i> sp.

G = Group

Table 2. Prevalence of gastrointestinal helminthic eggs recovered from Iranian Bactrian camel (*Camelus bactrianus*) according to species

Helminths	The number of infected camels	Prevalence (%) in sampled camels	Maximum and minimum egg counts (Per gram) in samples
<i>Nematodirus</i> sp.	8	32	48–53
<i>Trichuris</i> sp.	8	32	69–75
<i>Marshallagia</i> sp.	7	28	41–49
<i>Moniezia</i> sp.	7	28	20–30
<i>Strongyloides</i> sp.	4	16	1–10

best of our knowledge, there has been no previous research regarding the gastrointestinal helminths in Bactrian camel in Iran. Also, there is limited published data about the gastrointestinal parasites of Bactrian camel in other regions.

According to our results, 52% of the Bactrian camels were infected. The prevalence of gastrointestinal helminths in Bactrian camels was lower than the reported prevalence of 75.1% in the dromedary camel in Iran (Borji *et al.*, 2010).

The coprological examination of Bactrian camels showed that *Nematodirus* sp. and *Trichuris* sp. egg types were the most prevalent. Some of the gastrointestinal nematodes such as *Strongyloides* sp. are

fairly specific for the camels, although others are shared with other domestic ruminants (Ballweber, 2009). It seems that infection with the same parasites is due to grazing on common pastures. Parasitic infection can affect the performance and productivity of camels or may even result in death (Anwar & Khan, 1994). On the other hand, camels may have a role in the distribution of parasites among other domestic ruminants.

Temperature and moisture are the most critical determinants for survival of the Trichostrongyle eggs and larvae on pasture. Although Bactrian camels live in the cold desert regions of Ardabil province, northwest of Iran, and dromedary camels mainly live in the hot arid deserts of Iran, the diagnosed

helminths in Bactrian camels in the current study were the same as the results of Borji *et al's* (2010) study on helminths of dromedary camels in the northeast of Iran. Radfar *et al.* (2006) reported *Moniezia*, *Haemonchus*, *Stilesia* and *Dictyocaulous* infection in the slaughtered dromedary camels in the central part of Iran, which is partially different from our results. Infections with cestodes of the genus *Moniezia* are common and widespread in camels. The results of our study in Bactrian camels, similar to the previous studies in dromedary camels (Radfar *et al.*, 2006; Borji *et al.*, 2010), showed *Moniezia* as a common parasitic infection in Bactrian camels.

According to our results, the average age of the infected Bactrian camels was significantly higher than non-infected camels and there was a significant correlation between the age and the severity of infection. An age dependent acquiring resistance to gastrointestinal nematodes has been proven in some species (Silva *et al.*, 1998). Our results did not show a similar age dependent resistance in Bactrian camels in Iran. It seems that the increase in age of the camels is associated with the increase in the chance of parasitic encounter.

Since the population of the Bactrian camel in Iran is threatened with extinction, investigation of the gastrointestinal adult parasites based on post mortem examination with sufficient numbers of camels was impractical. The two humped camels are distributed in Ardabil province and are often retained in groups of 2-3 animals. The sampled camels in the current study were from different regions of the province and the obtained results can be relied on as the infecting parasites of the Bactrian camel population in Iran.

The results of the current study showed that deworming of Iranian Bactrian camels using anthelmintics is necessary to increase the productivity of camels.

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