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STUDY ON *EIMERIA* SPECIES INFECTING CAMELS (*CAMELUS DROMEDARIUS*) IN EGYPT.

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UMMARY

Camels *(Camelus dromedarius)* in Egypt were nvestigated for their infection with *Eimeria* spp. Forty percent of the examined camels were positive. Four *Eimeria* spp. were reported: *E. actriant* 35.1%, *E. rajasthani* 36.7%, *E. dromedarii* 2.9% and *E. cameli* 2.4%. Mixed nfection with two *Etmeria* species is the most common 32.2% then single spp. 5.4% then three spp. 1.5% and last four sp. 0.98%. The morphology of the unsporulated and sporulated oocysts of *Eimeria* spp. was described.

INTRODUCTION

In Egypt, camels are considered as one of the most important groups of the livestock forming resources of the country due to its meat production and its use as working animal on farms. Coccidiosis is a major cause of enteritis in domestic animals (Levine, 1985) including camels (Chineme, 1980). Coccidiosis induces loss of body weight due to decrease intake and absorption of nutrients from ingested food. As a result, growth is retarded and usually a longer period of time is needed for an animal to reach a specific weight (Fitzgerald, 1980).

The aim of this investigation is to identify and describe the types of *Eimeria* species found in camels (Camelus dromedorius) in Egypt since very few reports on the incidence of cameline coccidiosis in Egypt were reported {El-Magawry (1980), Sakr (1988) and El-Manyawe & Iskander (1994)}.

MATERIAL AND METHODS

Fresh fecal samples from 205 camels of varying ages and sex (from under one year to up to three years) were collected separately in plastic bags during the period from July 1996 to June 1997, from animal markets in Giza Governorate.

Both sedimentation and flotation (saturated salt solution) methods were used to detect the presence of *Eimeria* oocysts (Soulsby, 1982).

For determination of sporulation time, the collected oocysts were incubated in Petri dishes in 2.5 percent aqueous solution of potassium dichromate at 27°C. The oocysts were examined daily to observe the progress of sporulation. 50 sporulated oocysts from each species were examined and measured under the ocular micrometer, and the average dimensions were calculated. Identification of *Eimeria* spp. was done according to Kawasmeh and El-Bihari (1983), Kasim et al (1985), Higgins (1986), Sakr (1988), Sakr (1988) and Yagaub (1989).

RESULTS

Out of 205 camels (*Camelus dromedarius)* examined for *Eimeria* infection, 82 (40%) were positive. Table (1) shows the monthy rates of infection with coccidia in camels. The peak of infection occurred during August and lowest during November and December. Young camels under one year were more susceptible to *Eimeria* infection {total 105 infected 65 (61.9%)} than those of 1-3 years {total 62 infected 13 (20.96%)} and over 3 years {total 38 infected 4 (10.5%)} as shown in Fig. (1).

Infection with single species of *Eimeria* was recorded in 11 camels (5.4%), with two spp. 66 camels (32.2%), with three spp. 3 camels (1.5%) and with four spp. 2 camels (0.98%) table (2).

The oocysts detected in the fecal samples of the camels belonged to four species: *E. bactriani, E. rajasthani, E. dromedarii* and *E. cameli*.

Eimeria rajasthani was the most prevalent and predominant species 75 camels (36.7%) followed by *Eimeria bactriani* 72 (35.1%), Eimeria dromedarii 6 (2.9%) and *Eimeria cameli* 5 (2.4%) *Fig. (II).*

1- Eimeria bactriani(Iwanoff (1934)

The examined oocysts were nearly round to subspherical in shape and measured 20-36.7 µm in length by 20-26.7µm in width (average 25.1 X 22.4µm), length/width ratio 1.12:1. Oocyst wall composed of 4 layers about 2.5 µm in thickness. The micropyle and micropylar cap were absent. Oocystic residuum was absent. Sporocysts were ovoid in shape and measured from 10-13.3µm length by 6.7-10µm width (average 11.9 X 8.6 µm). Stieda body and sporocystic residuum were present. Sporulation time 6-7 days at 27°C. Fig. (III-1 & III-2).

2- Elmeria rajasthani {(Dubey & Pande (1963))

The examined oocysts were ellipsoidal in shape and measured 26.7-40µm in length by 20-33.3µm in width (average 33.7 X 26.7µm), with a length/width ratio 1.3 : 1. The oocyst wall composed of 2 layers outer layer light green and inner light brown. the wall measured 2 µm in thickness. The micropyle covered by micropylar cap, measured 2 µm in high by 5 µm in width. Polar granule and oocyst residuum were absent. Sporocysts were ovoid in shape and measured 10-13.3µm length by 8-8.5µm in width (average 11.7 X 8.3µm). Stieda body and sporocystic residuum were present. Sporulation time was 7-8 days at 27°C. Fig (III-3 & III-4).

Table (1): Monthly percentage of infected camels with *Eimeria spp.* during the period July 1996 - June 1997.

Month	Number of positive / total examined (%)	Month	Number of positive total examined (%)
July	11/17 (64.7 %)	January	3/17 (17.6 %)
August	13/17 (76.5 %)	February	4/17 (32.5 %)
September	11/18 (61 %)	March	7/17 (41.2 %)
October	6/17 (35.3 %)	April	8/17 (47.1 %)
November	1/17 (5.9 %)	May	8/17 (47.1 %)
December	1/17 (5.9 %)	June	9/17 (52.9 %)
Total	82/205 (40 %)		

Table (2): The number of Eimeria species in individual faecal sample of infected camels.

Number of Eimeria spp. which infected camels	Number of positive camels from 205 examined camels	Percentage
Infection with single species	11	5.4
Infection with two species	66	32.2
Infection with three species	3	1.5
Infection with four species	2	0.98
Total	82	40

Fig. (I): Age Distribution of Camels Infected with Eimeria spp.

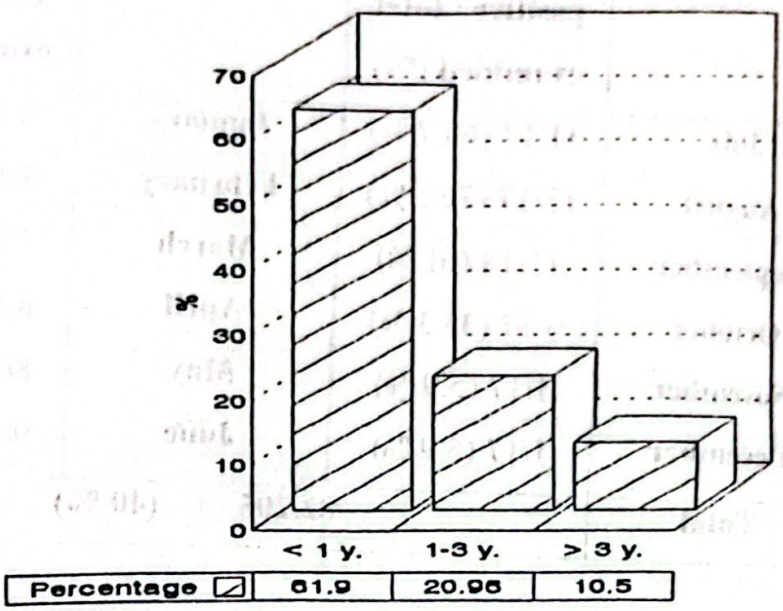


Fig. (II): Incidence of Different Species of Eimeria in Examined 205 Camels

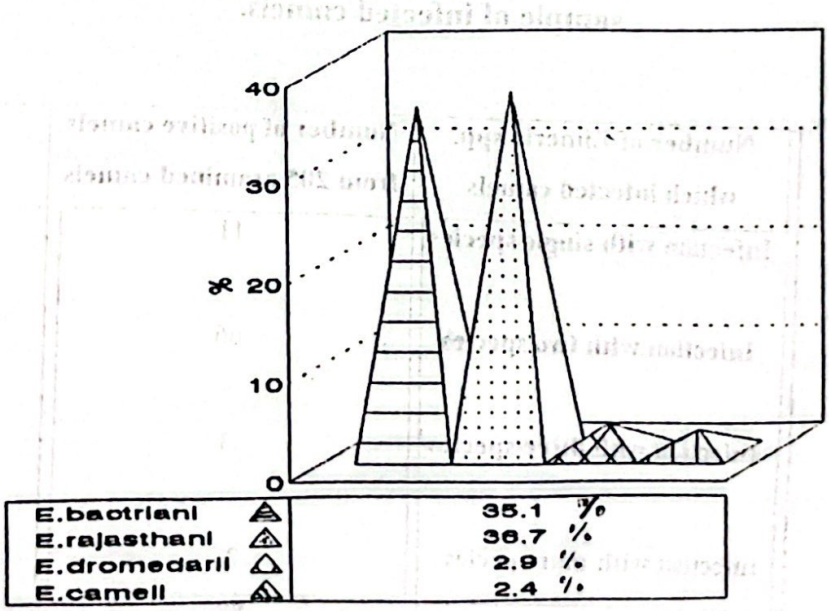
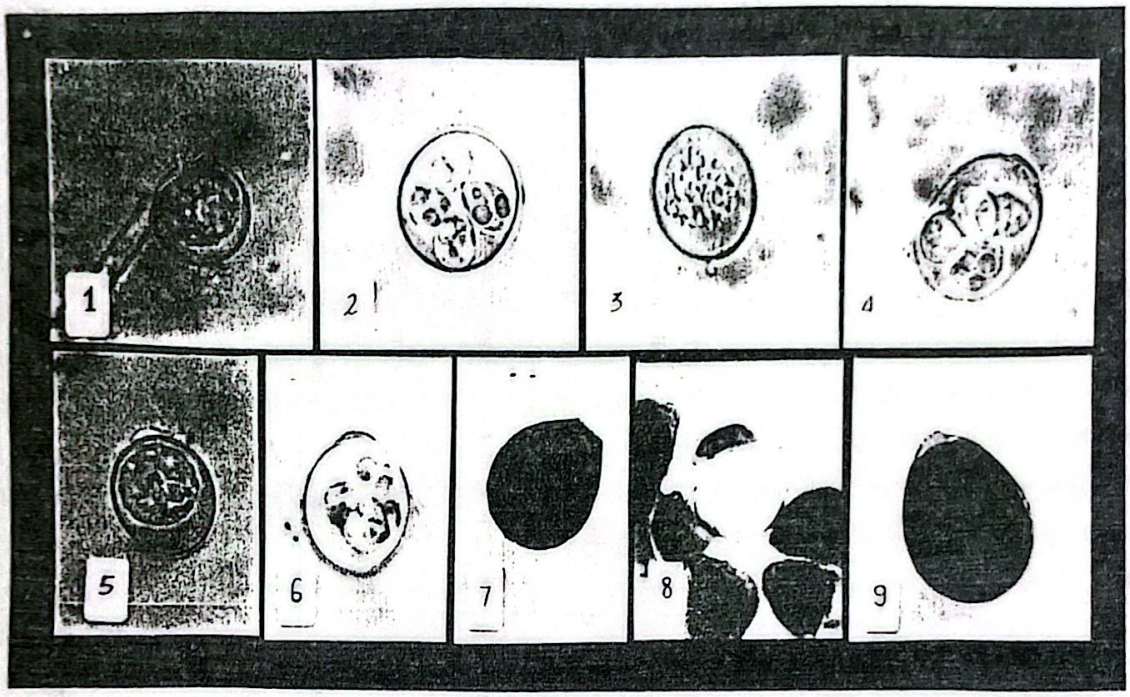


Fig. (III): Sporulated and unsporulated oocysts of the *Himeria* species in camel.



1- Unsporulated oocyst of *E. bactriani* (X 1000)
2- Sporulated oocyst of *E. bactriani* (X 1000)
3- Unsporulated oocyst of *E. rajasthani* (X 1000)
4- Sporulated oocyst of *E. rajasthani* (X 1000)
5- Unsporulated oocyst of *E. dromedarii* (X 1000)
6- Sporulated oocyst of *E. dromedarii* (X 1000)
7- Unsporulated oocyst of *E. cameli* (X 400)
8- Sporulated oocyst of *E. cameli* (X 400)

9- Oocyst of *E. cameli,* note the thin transparent capsule and the polar cap-lime structure fitted against the micropyle.

Table (3): Sporulation time of *Eimeria species* of infected amels as mentioned by previous authors and compared with the present study.

E.bactriani		*E.trasiliani*		*E.dromedarii*		*E.cameli*	
Author	Sporulated time	Author	Sporulated time	Author	Sporulated time	Author	Sporulated time
Jasmuf (1934)	5-8 days at room temperature	Dubey and Pande (1962)	7 days	Fasim (1985)	6-8 days at 25-28 °C	Henry and Masson (1932), Tsyzubov (1950)	10 - 15 days at 16 - 20 °C
Yakimoff (1935)	6 days	Fasim (1985)	7-8 days at 25 - 28 °C				
		Salz (1988)	6 days at 27 °C	Yagoub (1989)	5-7 days at 26-30 °C	Darwasmeh et al (1992)	23-25 days at 27 °C
Salz (1988)	5 days 27 °C	Yagoub (1989)	6-8 days at 25 - 30 °C			Yagoub (1989)	12-15 days at 26-30 °C
Present study	(6-7 days at 27 °C	Present study	7-8 days at 27 °C	Present study	8 days at 27 °C	Present study	28-30 days at 27 °C

Eimeria dromedarii {Yakimoff & Matschoulsky (1939)}

Cysts were ovoid to subspherical in shape and measured 24-33µm in length by 19-25µm in width (average 29.2 X 23µm), with a length/width ratio 1.3: 1. The oocyst wall composed of two layers outer light green and inner light brown. The wall thickness was 3µm. Micropyle covered by a dome-shaped cap, 7.5µm in width and 2.5-3µm high. The polar granule and oocyst residuum were present. The sporocysts were ovoid in shape and measured 7-11.5µm in length by 6-9µm in width (average 9.3 X 7.5µm). Stieda body and sporocystic residuum were absent. Sporulation time 8 days at 27°C. Fig (III-5 & III-6).

. Eimeria cameli {Henry and Masson (1932)}

The examined oocysts were truncate ovoid in shape, pale or dark brown to black in colour when passed in faeces. Oocysts measured 83.3-93.3µm in length by 63.3-70µm in width (average 84.5 X 67.8µm), with a length/width ratio 1.25 : 1. the oocyst wall was very thick and composed of three layers measured 8.7µm. The micropyle measured 16.7-23.3µm width by 3.3-13.3µm in height (average 18.3 X 7.1µm). Polar granule and oocyst residuum were not observed. The micropyle cap was absent. The sporocysts were elongated, pointed at two ends and measured 33.3-36.7µm length by 17.5-19µm in width (average 34.4 X 18.2µm). The stieda body was absent. Sporocystic residuum was present. Sporulation time was 28-30 days at 27°C. Fig (III-7 & III-8). Some freshly passed oocystsof *E. cameli* were enclosed in a transparent capsule containing a polar cap-like structure fitted against micropyle (Fig. III-9).

DISCUSSION

The present study revealed that the incidence of *Eimeria* in camels in Egypt was 40%, near similar rate of infection was reported by Kasim et al. (1985) in Saudi 41.6%. low rates of infection were mentioned by Gill (1976) in India 24%, Yagoube (1989) in Sudan 17.4%) and Sakr (1988) in Egypt 8.23%.

The present study showed that camels under one year were more susceptible to infection than older camels more than one year. Hussein et al. (1987) in Saudi Arabia reported that camel calves (98%) were more susceptible than older camels (18%). In India Dubey and Pande (1964) reported an incidence of coccidiosis of 62.2% in 45 camel calves.

This study recorded that 5.4% of camels were infected with single species of *Eimeria,* 32.3% with two species, 1.5% with three spp. and 0.98% with forur spp. In India Gill (1976) reported *Eimeria* species infection at the rate of 13.4%, 7.2%, 2.5% and 0.9% single; two spp., three spp. and four spp. respectively.

The species of *Eimeria* recorded in this study were *E. rajasthani* 36.7%, *E. bactriani* 35.1%, *E. dromedarii* 2.9% and *E. camell* 2.4%. In Iraq the reported species were *E. cameli* (40%) and *E. dromedarii* (50%) (Mirza and Al Rawas; 1976), in India *E. cameli, E. dromedarii* and *E. rajasthani* occurred at the rates 11.8%, 9.3% and 4.0% of

camels respectively (Gill, 1976). In Saudi Arabia Kasim et al. (1985) found oocysts of *E. cameli (19%), E. dromedarii* (42%) and *E. rajasthani* (22%) Sakr (1988) in Egypt found *E. bactriani* (6.09%) and *E. rajasthani* (1.9%). Two species of *Eimeria* were reported from camels in Egypt namely *E. dromedarii* (9.2%) and *E. noller* (5.5%) (El-Manyawe and Iskander, 1994). The oocysts of *E. dromedarii, E. rajasthani, E. bactriani* and *E. cameli* infecting camels in Egypt were described in the present study. They showed slight variation in size and other minor characteristics from the previous studies (Kawasmeh and El-Bihari, 1983; Kasim et al., 1985; Higgins, 1986; Sakr, 1988 and Yagaub, (1989). In this study the sporulation time of *E. cameli* (28-30 days at 27°C) was comparatively similar to that reported by Kawasmeh and El-Bihari (1983) (23-25 days at 27°C). However shorter period was recorded by Tsygankovely similar to that reported by Kawasmeh and El- Bihari (1983) (23-25 days at 27°C). However shorter period was recorded by Tsygankov (1950) 10-15 days at 16-20°C. The difference in sporulation time may be due to the difference in environmental condition and other ecological factors prevailing in different countries. Table (3) showed the variation in the sporulation time of different Eimeria spp. in camel.

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