# Contents

# Summary and Conclusion

***Some studies on ecto and endoparasites of camels in Assiut Governorate:***

The Arabian camel (*Camelus dromedarius*) plays an important role in the life of nomadic. It remains an integral part of the culture and agriculture of many countries in the Arab world. In addition to its importance as one of the sources of animal protein (milk and meat in many localities of the world. Camels are subjected to different etco and endoparasites that can affect their health, productivity and working power. In addition to the great importance of the muscular parasites infecting camel muscles from the public health point of view, therefore the aim of the present work was to study the prevalence rate, ecological and morphological characters of some etco and endoparasites infecting camels, in addition to some biological and serological studies on *Trypanosoma evansi* in Assiut Governorate. The study included examination and cultivation of faecal samples, examination of thin and thick blood smears, inspection of internal organs for detection of larval stages as well as adult parasitic stages infecting camel carcasses and survey of ectoparasites. In addition to collection of serum samples from examined camels for serodiagnostic procedures including IHA test using locally prepared antigen in the laboratory. This study included one hundred and seventy four camels of different sex and age slaughtered at (Bani Ady, Bany Rafeaa and El-Atamna) slaughter houses during the peroid from February 2003 to January 2004. Total prevalence rate of parasitic infestation in slaughtered camels was (87.4%) including protozoan parasites (86.2%), gastrointestinal helminths (77%), microfilariae in peripheral blood (9.77%), *Onchocerca* nodules (8%),

Hydatid cysts (24.15%), *Cysticercus dromedarii* 0.57%, lung worms larvae 5.74% and ectoparasitic infestation (85%).

**Protozoal infections:**

**1- *Eimeria spp.***

Camels were investigated for their infection with *Eimeria species*, 33.3% of the examined camels were positive. Three species were detected: *Eimeria cameli* (18.39%), *E. dromedarii* (16.1%) and *E.rajasthani* (6.9%). Infection with single spp. of *Eimeria* was the most common (26.43%), then mixed infection with 2 spp. (5.74%) and last 3 spp. (1.14%). Young camels are more susceptible to *Eimeria* infection (52%) than old aged ones (25.8%). The morphology of the unsporulated and sporulated oocyts as well as the sporulation time of each species was recorded.

**2- *Sarcocystis cameli* cysts:**

No macroscopic *Sarcocystis* cysts were detected. The over all infection rate with microscopic *Sarcocystis* cysts was 36.74%. Sarcocysts were recorded in the oesophagus of (36.20%), diaphragm of (27.58%), heart of (22.98%) and other sites of the body of (10.91%) examined camels. Adult camels (over 5 years) showed higher prevalence rate of infection (48.93%) than young ones (22.5%). Male camels revealed higher prevalence rate of infection (38.5%) than females (31.8%). The high prevalence rate of camel sarcocystosis can be explained by the fact that the animals are raised by nomads who keep large numbers of senitinel dogs with their herds; more over wild carnivorous are common in nomadic areas and all of these are likely to contaminate pasture with *Sarcocystis* sporocysts. Two morphologically distinct microscopic *Sarcocystis* cysts were detected in histological sections from indicator

organs. Thin walled cysts less than 1μm in thickness were the most common and were detected in cardiac, oesophageal and diaphragmatic muscles while thick walled striated cysts (average 2.88μm in thickness) were detected only in the oesophageal and diaphragmatic muscles.

**3- *Trypanosoma evansi***

Total prevalence rate of *Trypanosoma evansi* was 6.9%. The lower prevalence rate of infection in the present study might be attributed to the better veterinary services, the wide use of insecticides besides the usage of prophylactic medication. Adult camels showed higher prevalence rate (16.6%) than young ones (2.5%). The infectivity rate of *T. evansi* in males (7.69%) was slightly higher than females (4.54%). The results of seasonal variation of *T. evansi* revealed that high incidence was present in summer months (12.5%) while in winter it was not detected. This high rate of infection coincides with the high peak of tabanid flies which responsible for mechanical transmission of the disease. Regarding the morphological characters of *T. evansi* the results of measured forms coincide in mensural data with previous investigators. Abnormal multiplying forms of *T. evansi* during the present work were detected in the blood of camels as well as in the blood of experimentally infected mice and rats. These results might be due to drug therapy or immunoresponse of the host.

**4- *Theileria camelensis*:**

Total infection rate with *Theileria camelensis* was 8.62%. Adult camels showed higher prevalence rate (11.70%) than young ones (5%). The infection rate was slightly higher in females (9%) than males (8.5%). According to seasonal variations it was found that the higher prevalence rate was during summer season (13.3%) and the lower incidence was

during winter months (5%). These results might be due to seasonal variation of tick infestation during different seasons of the year. The species of Theileria identified in the present work was *Theileria camelensis* where the measurements and descriptive forms coincides with that of previous investigators.

**Helminth parasites:**

**1- Gastrointestinal helminths:**

Gastrointestinal helminth parasites constitute a major problem for camel industry in Assiut Governorate as 77% of the examined camels were infested by one or more of helminth parasitic stages in their faeces while 33.3% of the examined ones were infested with Eimerian oocysts Faecal analysis of the infected camels with helminths revealed that nematode eggs constituted the highest prevalence rate (88%) followed by cestode eggs (22.38%). Examination of the faecal samples of the animals under investigation revealed that they were infested with the ova of the following species: *Trichostrongy lus spp* (43.28%), *Haemonchus spp.* (38.8%), *Trichuris globulosa* (19.4%), *Trichuris ovis* (2.98%), *Oesophagostomum spp.* (16.4%), *Ostertagia spp.* (10.44%) and *Moniezia spp.* (22.38%). The infective third stage larvae obtained from coproculture were found to belong to 6 nematode genera including: *Trichostrongylus spp.*, Trichostrongylus colubriformis, *Haemonchus spp; cooperia spp*, *Ostertagia spp., Oesophagostomum spp.* and *Nematodirus spp*. The infection rate with adult cestodes was 47%. Three species of adult cestodes were detected in the small intestine namely *Avitellina centripunctata* (25.23%), Moniezia expansa (17.24%) and *Stilesia vittata* (4.59%). Two larval stages of cestodes were detected during the present work including hydatid cysts (24.15%) and *Cysticercus dromedarii* (0.57%).

Seven nematodes namely *Haemonchus longistipes* was detected in the abomasum, *Cooperia onchophora*, *Nematodirus filicollis* and *strongyloides papillosus* in the smalll intestine, *Trichuris globulosa*, *Trichuris ovis* and *Oesophagostomum venulosum* in the large intestine.

**2- Hydatid cysts**

The incidence of hydatidosis in slaughtered camels was 24.15%. It was found that the percentage of infestation was higher in old camels 36.17% rather than young cases (10%). The incidence of infestation was 26.92% in males and 15.3% in females. The lungs were the most predilection site for hydatid cysts (87.24%) than liver 12.75% while spleen, heart and kidneys were free. The incidence rate of fertility was 61% and the percentage of fertile cysts was higher in lungs (65.38%) than in liver (31.57%). According to the condition of the detected hydatid cysts it was found that the percentage of fertile, sterile and calcified cysts was 61%, 16.1% and 22.81% respectively. Macroscopic, and microscopic examination as well as the type and condition of the detected cysts were studied in different examined organs. From the present study it was found that in upper Egypt camels play an important role as an intermediate host of Echinococcus granulosus as well as maintenance of high level of hydatidosis as 61% of the cysts were fertile.

**3- *Cysticerus dromedarii*:**

The incidence of *Cysticerus dromedarii* among slaughtered camels was very low 0.57%, this may be attributed to the scarcity of the definitive host *Hyaena hyaena*. Heart was the main predilection seat of *C. dromedarii*. The detected cysticerci were at various degenerative stages.

**4-lung worms larvae:**

The prevalence of lung worms larvae was 5.74%. Two species of first stage larvae were detected namely *Dictyocaulus spp* (2.3%) and *Protostrongylus africanus* (3.44%). The morphological characters and prevalence rate of infection of the detected larvae were discussed.

**5- Microfilariae in camel's blood:**

The overall incidence of microfilariae in the peripheral blood was 9.77%. Two types of microfilariae were detected: *Dipetalonema evansi* microfilariae in (8%) and *Setaria equina* microfilariae in (1.72%) of examined camels. The prevalence rate was not influenced by sex but it was influenced by age of the animal. There was inverse relationship between age of the camel and prevalence of infection. According to seasonal variations the highest prevalence rate of infection was recorded in summer months (17.7%) and the lowest rate was during winter (5%) this may be due to correlation between the infestation rate and the flourishing of the fly population during this period of the year. The identification of the unsheathed *Dipetalonema evansi* microfilariae and the sheathed microfilariae of *Setaria equina* was based on their measurements and morphological characters which coincided with those of previous literatures.

**6- *Onchocerca fasciata*:**

*Onchocerca fasciata* nodules were detected in 8% of slaughtered camels. There was parallel correlation between prevalence rate and age of slaughtered camels. Shecamels exhibited higher infection rate 18.18% than males 4.61%. According to seasonal variation it was found that high prevalence of infection was recorded in summer season (20%) while in winter and autumn it was not detected, this may be due to the flourishing

of the vector (S) during this period of the year. Morphological characters and measurements of adult worms embedded in *Onchcerca* nodules, uterine and skin microfilariae were coincided with those of previous investigators. No microfialiae were detected in peripheral blood. Microscopic appearance of nodules as well as location, and condition of the detected nodules were recorded.

Camels seems to play an important role as carriers for some parasitic diseases and may be considered as a source of transmission and spreading of parasites to native camels or other ruminant species sharing in susceptibility.

**Ectoparsites:**

Camels are exposed to a wide range of external ecto parasites which irritate, injure or deblitate, in addition to the role they played in transmision of parasitic, bacterial and viral diseases to man and animals. The overall prevalence rate of infection with ectoparasites was 85%. Three species of ectoparasites were detected including ticks (19.54%), *Sarcoptes Scabiei var cameli* (1.72%) and *Cephalopina titillator* larvae (61.5%). Older camels were more susceptible than younger individuals. Females exhibited higher prevalence rate of infection than males. *Sarcoptes Scabiei var cameli* was the only detected mite. The highest prevalence of mites (5%) was recorded in winter while the lowest (2.22%) was recorded in summer. Two species of ticks were recorded including *Hyalomma dromedarii* and *Amblyomma lipidum*. The highest incidence of ticks (31.11%) was detected in hot months while the lowest was recorded in winter (5%). Male ticks of *H. dromedarii* appeared to dominate over female ones.

*Cephalopina titillator* larvae were detected in the posterior pharyngeal and nasal mucosae of camels causing nasal myiasis. The three larval instars were detected. The morphological characters, measurement of the larvae and necropsy finding were recorded. The rate of infections was higher in autumn (77.8% ) and spring (64.4%) than in winter (50%) and summer (48.9%).

**Experimental work and biological studies:**

**1- Susceptibility of laboratory animals to infection with *T. evansi*:**

In the present work it was found that mice and rats are highly susceptible to infection with *T.evansi.* Mice ran an acute course of infection and higher pattern of parasitaemia without fluctuation while the pattern of infection of rats ran a chronic course with two peaks of parasitaemia. The length of the prepatent period and survival time was 3 days and 14-36 days in mice while it was 3-4days and 90-141 days in rats respectively.

**2-Effect of preservation at low temperature on the viability and infectivity of *T. evansi:***

Isolated strain of *T.evansi* in the present work was successfully maintained viable at low temperature 4°c for a period of about 4 days. On the other hand the strain was capable of producing infection in laboratory animals for a period of about 36 hours from obtaining the infective sample.

**Parasitological diagnosis of *Trypanosoma evansi*:**

**1- Blood smear examination**

2- **Serodiagnostic technique** by application of **IHA test**

Some immunological studies on *T.evansi:*

Serodiagnostic technique by application of IHA test using locally prepared antigen of *T.evansi* prepared in the laboratory of Parasitology of Faculty of Medicine, Assiut University by the researcher according to scientific literatures from trypomastigote of *T. evansi* obtained from the blood of experimentally infected rats and mice with the blood of camels naturally infected with *T.evansi.* Blood smear examination revealed an incidence 6.9% infection. On the contrary IHA test provide that 16.7% had detectable antitrypanosomal antibodies. All parasitologically positive cases were also serologically positive. Moreover the serological test was sensitive in detecting 10.3% asymptomatic carriers of infection with negative blood smear. It was clear from the results that IHA test is easy, practical, specific to perform and sensitive for detecting antitrypanosomal antibodies in the sera of infected camels. Additionally the locally prepared antigen during the present work may be also valuable for diagnosis of trypanosomiais in farm animals due to other Salivarian group. Finally serodiagnosis tests may there fore have place in the future for surveillance and control of *T.evansi* infections in camels.