STUDIES ON ROLE OF TICKS IN TRANSMISSION OF SOME BLOOD PARASITES IN CAMEL

El-seify, M.A[1]., Ebrahaium, A.A[2].,Hashem,M.A[3]., Kamel,Z.M[4].

[1)] Parasitology Department, Faculty of Veterinary Medicine, Kafrelsheikh, University.

[2)] Poultry Diseases Department, Faculty of Veterinary Medicine, South Valley University.

[3)] Animal Health Research Institute, Parasitology Department, Mansoura branch.

[4)] Animal Health Research Institute, Parasitology Department, Aswan branch.

ABSTRACT

This study was carried out in the imported camels that enter Egypt coming from Sudan those were passed on Abu-Simbuel region (Abu-Simbuel Abatoir) of Aswan Governorate, southern Egypt in the period from November, 2015 to October, 2016, to identify tick species infesting camels, study the prevalence of ticks infestation in camels all over the year andthe prevalence of ***Trypanosoma*** *and* ***microfilaria*** *infection of camels, also the role of ticks in transmission of* ***Trypanosoma*** *species. The overall prevalence in the tick infestation was recorded as (60.96 %) (1463/2400) .The higher infestation were recorded in November, December (2015) and January (2016) and lower infestation were recorded in June.A total of (960) ticks were collected from the infested camels and identified.* ***Hyalomma dromedarii*** *was the predominant tick species and comprised (83.54 %) of the collected ticks. Other tick species found in very low numbers were* ***Rhipicephalus praetextatus****(4.27 %),* ***Hyalomma anatolicum anatolicum*** *(3.85%),****Hyalomma impeltatum*** *(2.92 %),* ***Rhipicephalus sanguineus*** *(2.29 %),****Hyalomma anatolicum excavatum****(1.35 %), Hyalomma marginatum rufipes (1.12 %), and Hyalomma truncatum (0.63 %).(99) blood samples from (4800)collected blood samples was infected by* ***Trypanosoma evansi*** *and hence constitute a prevalence rate of (2.0625%),with highest prevalence rate infection was (8.5 %) in October, alsofounded that (2) blood samples from(4800) samples that infected by* ***microfilaria*** *in February and December (winter) with prevalence rate (0.042 %)(2/4800).We founded two samples in gut of male ticks contain developed stages of* ***Trypanosoma*** *in (March and June).*

Key words: Camels,Ticks,*Trypanosoma,Microfilaria,*Transmission.

INTRODUCTION

Ticks are blood-sucking ectoparasitic arthropods that transmit many pathogens of livestock, including bacteria, protozoa, and viruses ***(Barker & Murrell, 2004; Jongejan & Uilenberg, 2004)***. Camels in Egypt were found to be mainly infested by *Hyalomma dromedarii* (95 %) together with *Hyalomma marginatum* subspecies, *Hyalomma anatolicum excavatum* and *Hyalomma* species nymphs ***(Van Straten & Jongejan 1993)***. In the same area and on the same animal species ***El Kady& Shouky (2001)*** reported that *H. dromedarii*; *Hyalomma impeltatum*, *H. a. excavatum* and *H. a. anatolicum* represented 96 % of the tick population with higher infestation in March to November and a mean monthly total of 22–78 ticks per animal.

In Sudan, ***Karrar et al., (1963)*** reported that *H.dromedarii* was the main tick species of camels together with *Amblyomma lepidum*, *H. impeltatum*, *Rhipicephalus sanguineus sanguineus*, *Rhipicephalus simus*, *H. a. excavatum*, *H. truncatum* and *H. m. rufipes.*

Blood parasites especially*Trypanosoma spp*. and *filaria spp*. are known to affect the health of camels leading to anemia, wasting and death in heavy infection ***(Jorgen & Brian, 1990)***. *Trypanosoma* infection (surra) is a serious disease affecting a camels ***(Desquesnes et al., 2013)***, results in high mortality and the reduced fertility, generalized loss of body condition, anemia, and eventual death ***(Luckins, 1998).*** *Trypanosomes* are parasites transmitted by ectoparasites such as the *tsetse* fly, *Tabanidae* (horse flies), and by various ticks ***(Magona et al. 2009; Burgdorfer et al. 1973).*** Also in study made by ***Hussein et al., 2009*** during examination of some ticks for parasites that may infect livestock in Saudi Arabia, *Trypanosoma* developmental stages were

found in the tick *Hyalomma dromedarii* salivary glands (unpublished data). However, many *tabanid* flies were observed feeding on camels in the regions where camels showed infection with *T. evansi*.

The most famous Microfilarial infection that infest camel is *Dipetalonema evansi*, a parasite of the pulmonary arteries, mesentery and lymph vessels, ***(Fassi-Fehri,1987),*** recorded in Saudi Arabia, Iran and Egypt ***(Wernery & Kaadan,2002).*** It appeared as a snake like with a rapidly, forward movement across the microscopic field in wet smear while in Giemsa stained smears showed a coiled or twisted appearance, ***(Hashem.M.A et al.,2008).***

This work is aimed to; Study the prevalence of tick's infestation in camels all over the year, identification of tick's species that infest camels and incidence rate of each species, the prevalence of *Trypanosoma* and *microfilaria* infection of camels in Aswan and the role of ticks in transmission of *Trypanosoma* species.

MATERIALS AND METHODS

The study made on imported camels that enter Egypt coming from Sudan those were passed on Abu-simbuel region (Abu-simbuel Abatoir) of Aswan Governorate, Southern Egypt in the period from November ,2015 to October, 2016.

I. Collection and examination of blood samples:

Blood samples were randomly collected each season from camels (imported camels of different ages).We were collected 4800 Blood samples from the jugular vein of each camel using EDTA vacationers (Ethylene diamine tetra acetic acid as anti-coagulant). Wet blood films and blood smears (thin and thick) wore made from the collected blood

samples ***(The World Assembly of Delegates of the OIE in May 2012),*** formorphological studies and identification of the *Trypanosoma species* and *microfilaria* species.

Wet blood films:

A small drop of blood (2–3 µl) was placed on a clean glass slide and placed over it a cover-slip to spread the blood as a monolayer of cells. Then examined by light microscopy (200 ×) to detect any motile *trypanosomes* and movement of *microfilaria*.

Thin smears:

A small drop of blood (3–5 µl) was placed at one end of a clean microscope slide and drawn out a thin film in the usual way. Air-dry briefly and fixed in methyl alcohol for 5 minute and allowed drying. Then we stained the smears in Giemsa stain for 25 minutes. Pour off stain and wash the slide in tap water and dry. Examine at a magnification of (400–1000×) with oil immersion. This technique permits detailed morphological studies and identification of the *Trypanosoma* species and *microfilaria* species.

Thick smears:

Place a large drop of blood (10 µl) on the center of a microscope slide and spread with a tooth pick or the corner of another slide so that an area of approximately 1.0–1.25 cm in diameter is covered. Air-dry for 1 hour or longer, while protecting the slide from insects. Place the slide in a horizontal position then stain the unfixed smear with Giemsa's Stain, for 25 minutes. After washing and drying, examine the smears by light microscopy at a magnification of (400–1000×) with oil immersion.

II. Tick collection and identification:

We were examined 2400 camels for ticks infestations (the same camels that blood was been collected) in the same period of the study and collected 960 specimens of ticks from camels (480 male ticks &480 female ticks). Ticks were collected from animals without damaging their mouth parts ***(Soulsby, 1982).***These specimens were brought to the Laboratory of Parasitology (Animal health research institute - Aswan) for taxonomic identification according to the keys given by ***(Walker et al., 2007).*** Ticks were identified to the species level according **to** ***Hoogstraal (1956)*** and ***Walker et al. (2003)***, taking into consideration the recent valid names of the genus and species ***(Barker & Murrell, 2004).***

RESULTS

In this study annual prevalence of the tick's infestation was founded (60.96 %) (1463 infested camels /2400 examined camels).

Table (1): prevalence of tick's infestation on camels:

Monthexamined	camels(male)	infested camels(male)	% of infestations
January	200	187	93.5 %
February	200	161	80.5 %
March	200	139	69 %
April	200	111	55.5 %
May	200	61	30.5 %
June	200	30	15 %
July	200	39	19.5 %
August	200	93	46.5 %
September	200	122	61 %
October	200	151	75.5 %
November	200	182	91 %
December	200	187	93.5 %
Total	2400	1463	60.96 %

We founded that the high prevalence rate of tick's infestation on camels was (89.2 %) in winter followed by (75.83 %) in autumn, (51.83%) in spring and the low prevalence was (27 %) in summer. The higher infestation of ticks on camels were recorded in November, December (2015) and January (2016) and lower infestation were recorded in June.

Table (2): seasonal influences of tick's infestations on camels:

Season examined camels (male)		infested camels (male)	% of infestations
Winter	**600**	**535**	**89.2%**
Spring	**600**	**311**	**51.83%**
Summer	**600**	**162**	**27 %**
Autumn	**600**	**455**	**75.83%**
Total	**2400**	**1463**	**60.96%**

Hyalomma dromedarii was found to be the predominant (83.54 %) tick species infesting camels. Other tick species found in very low numbers were ***Rhipicephalus praetextatus*** (4.27 %), ***Hyalommaanatolicum anatolicum*** (3.85 %), ***Hyalomma impeltatum*** (2.92 %), ***Rhipicephalus sanguineus*** (2.29 %), ***Hyalomma anatolicum excavatum*** (1.35 %), ***Hyalomma marginatum rufipes*** (1.12 %), and ***Hyalommatruncatum*** (0.63 %).

Table (3): Ticks species that infest camels:

Month	Jan.	Feb.	Mar.	Apr.	Ma.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
H.dromedarii	62	68	67	60	62	61	71	72	75	76	60	68	802
H.impeltatum	4	2	4	3	3	1	1	1	1	2	4	2	28
H.anatolicum anatolicum	5	3	3	3	3	4	3	1	2	2	5	3	37
H.anatolicum excavatum	2	2	0	2	1	2	0	0	0	0	1	3	13
H.marginatum rufipes	0	1	0	2	2	3	1	0	0	0	1	1	11
H. truncatum	1	0	0	0	0	2	0	3	0	0	0	0	6
Rh. Praetextatus	3	4	4	6	5	3	4	3	2	0	6	1	41
Rh. Sanguineus	3	2	2	4	4	3	0	0	0	0	3	1	22

Table (4): Ticks species that infest camels (%):

Month	Jan.	Feb.	Mar.	Apr.	Ma.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total%
H.dromedarii	78.75	85	83.75	75	77.57	6.25	88.75	90	93.75	95	75	85	83.65
H.impeltatum			5	2.5	53.75	3.75	1.25	1.25	1.25	1.2	52.5	52.5	2.92
H.anatolicum anatolicum	6.25	3.75	3.75	3.75	3.75	5	3.75	1.25	2.5	2.5	6.25	3.75	3.85
H.anatolicum excavatum	2.5	2.50	2.5	1.25	2.5	0	0	0	0	1.25	3.75		1.35
H.marginatum rufipes	0	1.25	0	2.5	2.5	3.75	1.25	0	0	0	1.25	1.25	1.12
H. truncatum	1.25	0	0	0	0	2.5	0	3.75	0	0	0	0	0.63
Rh. Praetextatus	3.75	5	5	7.5	6.25	3.75	5	3.75	2.5	0	7.5	1.25	4.27
Rh. Sanguineus	3.75	2.5	2.5	5	5	3.75	0	0	0	0	3.75	1.25	2.29

In this study, the occurrence of *Trypanosoma evansi* was reported 99 positive samples (2.0625%)among 4800 examined camels.

Table (5): Prevalence of *Trypanosoma evansi* infection of the examined camels by blood film smears (Jugular vein):

MonthBlood	samplesexamined	Blood samples infected	Prevalence%
January	400	0	0 %
February	400	0	0 %
March	400	0	0%
April	400	18	4.5%
May	400	18	4.5 %
June	400	8	2%
July	400	2	0.5%
August	400	19	4.75 %
September	400	0	0 %
October	400	34	8.5 %
November	400	0	0 %
December	400	0	0 %
Total	4800	99	2.0625 %

In this present study,we founded that *Trypanosoma evansi* infection showed the highest prevalence rate in Spring (3 %) followed by Autumn (2.83 %), Summer (2.42 %) and low prevalence rate in Winter (0 %) and also showed the highest prevalence rate of *Trypanosoma evansi* infection was 8.5 % in October followed by August 4.75 %, while the period from November 2015 to March 2016 had the lowest prevalence rate (0%)and that mean also outbreaks of infection was higher during rainy season (June to October).

Table (6): Seasonal influences of *Trypanosoma evansi* infection of the examined camels by blood film smears (Jugular vein):

Month Blood	samples examined	Blood samples infected	Prevalence %
Winter	1200	0	0 %
Spring	1200	36	3 %
Summer	1200	29	2.42 %
Autumn	1200	34	2.83 %
Total	4800	99	2.0625 %

In this study, the occurrence of ***microfilaria*** was reported 2 infected samples in February and December (winter) with prevalence rate (0.042%) among 4800 examined camels.

Table (7): Prevalence of *Microfilaria* infection of the examined camels by blood film smears (Jugular vein):

MonthBlood samplesexamined		Blood samples infected	Prevalence %
January	400	0	0 %
February	400	1	0.25 %
March	400	0	0%
April	400	0	0%
May	400	0	0 %
June	400	0	0%
July	400	0	0%
August	400	0	0 %
September	400	0	0 %
October	400	0	0 %
November	400	1	0.25 %
December	400	0	0 %
Total	4800	2	0.042 %

In this study we examined (480) male of ticks and (480) female of ticks by monthly rate (40) male tick and (40) female tick,we founded two samples in gut of male ticks contain developed stages of *Trypanosoma*species *in* (March and June).

DISCUSSION

In this study annual prevalence of the tick's infestation was founded (60.96 %) (1463 infested camels /2400 examined camels),and those result in agreement with reported by ***Moshaverinia & Moghaddas (2015)*** (59.25 %) in Iran, ***Dinka et al., 2010*** (61.46 %) in Eastern Ethiopia. On the contrary, the prevalence rate of ticks infestations obtained in this study was lower than those reported by ***Lawal et al., 2007*** (92.7%) in Nigeria, ***Kiros et al., 2014*** (96.6 %) in Tigary–Northern Ethiopia.

We founded that the high prevalence rate of tick's infestation on camels was (89.2 %) in winter followed by (75.83 %) in autumn, (51.83%) in spring and the low prevalence was (27 %) in summer. The higher infestation were recorded in November, December (2015) and January (2016) and lower infestation were recorded in June that result in agreement with reported by ***Ahmed (1999)*** (higher infestations in winter), ***El Tigani & Mohammed (2010)*** February (cold season), but in contrast of result reported by ***Diab et al., 2001*** that higher infestation in March to November in Egypt, ***Moshaverinia & Moghaddas (2015),*** higher infestations in summer and spring .

Hyalomma dromedariiinpresent studywas found to be the predominant species of ticks been founded **(83.54 %)** and that in agreement with reported by ***El Tigani & Mohammed(2010)*** (69.64%), ***Moshaverinia et al., 2013*** (70.76 %), ***Elghali & Hassan (2009)*** (89 %) in Northern Sudan, ***Van Straten & Jongejan (1993) ; Diab et al., 2001*** (95 %) in Egypt , **Karrar et al., 1963** reported that in Sudan and also ***Osman (1977)*** in Darfur State **, *Al Waer (2004)*** in Libya, ***Salimabadi et al. 2010 ; Nazifi et al. 2011; Fard et al. 2012*** in Iran , in contrast of result reported ***Kiros et al., 2014*** in Tigary –Northern Ethiopia that ***Rhipicephalus*** species was predominant (61.77 %) .

Beside ***Hyalomma dromedarii,*** seven species were founded in this present result ***Rhipicephalus praetextatus*** **(4.27 %),** ***Hyalomma anatolicum anatolicum*** **(3.85 %),** ***Hyalomma impeltatum*** **(2.92 %),** ***Rhipicephalus sanguineus*** **(2.29 %)**, ***Hyalomma anatolicum excavatum*** **(1.35 %),** ***Hyalomma marginatum rufipes*** **(1.12 %)**, and ***Hyalomma truncatum*** **(0.63 %).**

Rhipicephalus praetextatus (4.27 %) and ***Hyalomma anatolicum anatolicum*** (3.85 %) was in agreement with those reported by ***Elghali & Hassan (2009)*** (0.30 %) & (3.3 %) in Northern Sudan respectively. Also reported in camels by ***Abdel-Shafy (1994; 2000)*** in Egypt; ***Diab et al., 2001*** reported ***Hyalomma anatolicum anatolicum*** in Egypt. ***Moshaverinia et al., 2013*** founded ***Hyalomma anatolicum anatolicum*** (4.81 %) in Iran; ***El Tigani & Mohammed (2010)*** reported that ***Hyalomma anatolicum anatolicum*** (4.35 %) in El Butana area mid-eastern Sudan.

Hyalomma impeltatum (2.92 %), was in agreement with those reported by ***(Steward, 1950; Karrar et al., 1963; Osman, 1977; Latif, 1985; Shommein & Osman 1987; Yassir et al., 1992)*** in Sudan, ***Diab et al., 2001*** in Egypt, ***Moshaverinia et al., 2013*** **(**0.09 %) in Iran **,** ***Nazifi et al., 2011*** (0.4%) in Qeshm Island, Iran, ***El Tigani & Mohammed (2010)*** (6.39%) in El Butana area mid-eastern Sudan, ***Elghali & Hassan (2009)*** (7.7 %) in Northern Sudan.

Rhipicephalus sanguineus (2.29 %), was in agreement with those reported by ***Karrar et al., 1963*** in Sudan, Pakistan ***Elghali & Hassan (2009)*** (0.09 %) in Northern Sudan, ***El Tigani & Mohammed (2010)*** (2.22%) in El Butana area mid-eastern Sudan, ***Lawal et al., 2007*** in Nigeria.

Hyalomma anatolicum excavatum (1.35 %), was in agreement with those reported by ***Moshaverinia et al., 2013*** (19.25 %) in Iran, Karrar et al.,1963 in Sudan, ***Van Straten & Jongejan (1993); Abdel-Shafy(1994;2000) ; Diab et al., 2001*** reported that in Egypt, ***Nazifi et al., 2011*** (22%) in Qeshm Island- Iran.

Hyalomma marginatum rufipes (1.12 %), was in agreement with those reported by ***(Steward, 1950; Karrar et al., 1963; Osman, 1977; Latif, 1985; Shommein & Osman 1987; Yassir et al., 1992)*** in Sudan, ***Elghali & Hassan (2009)*** (0.25 %) in Northern Sudan, ***Van Straten & Jongejan (1993)*** in Egypt, ***El Tigani & Mohammed (2010)*** (7.29 %) in El Butana area mid-eastern Sudan, ***Lawal et al., 2007*** (22.9 %) in Nigeria, ***Kiros et al., 2014*** (47.4 %) in Tigary –Northern Ethiopia.

Hyalomma truncatum (0.63 %), was in agreement with those reported by ***(Steward, 1950; Karrar et al., 1963; Osman, 1977; Latif, 1985; Shommein & Osman 1987; Yassir et al., 1992)*** in Sudan, ***Elghali &Hassan (2009)*** **(0.29 %)** in Northern Sudan***, El Tigani & Mohammed (2010)*** **(0.71 %)** in El Butana area mid-eastern Sudan ***Kiros et al., 2014*** **(8.9 %)** in Tigary –Northern Ethiopia, ***Lawal et al., 2007*** **(11.9 %)** in Nigeria.

In this study, the occurrence of ***Trypanosoma evansi*** was reported 99 positive samples (2.0625%) among 4800 examined camels this result was in agreement with those reported by ***Dafalla (1988)*** (2.04 %) in Gedarif, ***Ngaira et al 2013*** (2.3 %) in eastern Kenya, ***Birhanu et al.2015*** (2.7%) in Afar –Northern Ethiopia, ***Abd-Elmaleek et al.2014*** (3.06 %) in Assiut-Egypt. But lower than those reported by ***Zarif-Fard & Hashemi-Fesharaki (2000)*** (10 %) in Iran, ***Mahran (2004)*** (11.5 %) in Shalatin city –Red sea governorate, ***Elhaig et al, .2013*** (12 %) in Ismailia –Egypt,

El-Hewairy et al., 2014 (16.9 %) in Abu-simbuel and Darwa city – Aswan governorate, considered higher than that previously recorded by ***Dafalla (1998)*** (1.12 %) in Kassala.

In this study, we founded that ***Trypanosoma evansi***infection showed the highest prevalence rate in Spring (3 %) followed by Autumn (2.83 %), Summer (2.42 %) and low prevalence rate in Winter (0 %) and also showed the highest prevalence rate of ***Trypanosoma evansi***infection was 8.5 % in October followed by August 4.75 %, while the period from November 2015 to March 2016 had the lowest prevalence rate (0%)and that mean also outbreaks of infection was higher during rainy season(June to October), this was in agreement with those reported by ***Enwezor & Sackey (2005)***. While ***Elamin et al, 1998*** reported that the higher prevalence infection in Sudan was in dry season (November to May) than in wet season (June to October), ***Mochabo,2003*** indicated that highest prevalence of infection in Kenya was occurred immediately after the rainy season as well as in the dry season. ***Mahran (2004)*** reported that the highest infection rate in Shalatin city- Egypt was in the summer season but the lowest rate in spring season. ***Zayed et al, 2010***, noticed that higher prevalence rate in Egypt was in winter followed by summer and spring.

In this study, the occurrence of ***microfilaria*** was reported 2 infected samples in February and December (winter) with prevalence rate (0.042%) among 4800 examined camels. This result was in agreement with those reported by ***Karimi et al.,2015*** (0.88 %) in Central regions of Iran , ***Al-Khalifa et al., 2009*** (1 %) in Riyadh –Saudi Arabia , ***Sazmand et al., 2015*** (2 %) in south-east Iran, ***Mohammed et al., 2007*** (2.32 %) in Shika Zaria –Nigeria. The occurrence of D. evansi in camels was first

recorded as case reports from Asian countries by ***Baylis and Daabney (1923)*** and ***Boulanger (1924)*** and from Egypt by ***Nagaty (1947)***. ***Pathak et al. (1998)*** found microfilaria of D. evansi in both sexes in Rajasthan, India. ***Moghaddar et al. (1992)*** reported the occurrence of D. evansi in dromedary camels of Fars Province of Iran for the first time. Infection of camel with this parasite has been also reported from Sudan, the Far East and eastern parts of the farmer USSR, North and East Africa, and in Pakistan ***(Soulsby 1982; Kaufman 1996; Butt 1995; Pathak et al. 1998; Mahran 2004)***. The high prevalence of D. evansi was previously reported in certain areas of Russia, Pakistan and Iran ***(Pathak et al. 1998; Butt 1995; Oryan et al 2008)***. On the contrary, the occurrence of ***D. evansi***obtained in this study was lower than those reported by ***Abdel-Rady et al., 2012*** (5.9 %) in El-Wady El- gaded (local breed), ***(Hussein et al., 2009*** (6 %)in Eastern regions –Saudi Arabia, ***Abdul-Salam & Al-Taqui (1995)*** (11 %) in Kuwait, ***Sazmand et al., 2013*** (12.92 %) in different regions of Iran, ***Elamin et al.,1993*** (7of 14) camels infected by ***D.evansi*** in Sudan. In contrast ***Abdel-Rady et al., 2012*** reported that prevalence in imported breed of dromedary camels was (0 %) by microfilaria infection in Upper Egypt Governorates.

In this study we founded two samples in gut of male ticks contain developmental stages of ***Trypanosoma*** in (March and June). This result was in agreement with reported by ***(Magona et al. 2009; Burgdorfer et al. 1973),*** that said***Trypanosomes*** are parasites transmitted by various ticks. ***(Hussein et al., 2009)*** also reported that during examination of some ticks for parasites that may infect livestock in Saudi Arabia, ***Trypanosoma*** developmental stages were found in the tick ***Hyalomma dromedarii*** salivary glands (unpublished data).

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