

Mechanical Vectors related to camel trypanosomosis in Al Kharj Town, Riyadh Region, kingdom of Saudi Arabia

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Abstract

The present study was conducted to determine the prevalence of camel trypanosomosis and its vectors in Al-Khari, Central part of Saudi Arabia. One hundred and seven serum samples were examined to detect the of *T. evansi* infection by CATT test. Eight NZI traps for sampling of biting flies were deployed in farms where camels and cows were kept, water treatment station, people residence, cactus farm, irrigated areas, open Range, sheep pens and behind barns. Camel trypanosomosis prevalence was 21.5% during the study period. The highest catches of flies were around water treatment station and people resident. The biting flies caught were *Stomoxys calcitrans* and some mosquitoes species. *Stomoxys calcitrans* may be an important mechanical vector of camel trypanosomosis in the study area.

A peak of muscids abundance was observed in March and April.

Keywords: Camel trypanosomosis, Muscids, Mosquitoes, Seasonal variation, Al-Khari and Nzi traps.

Introduction:

Camel population in Saudi Arabia is estimated at eight hundred thousand head (Ministry of Agriculture Annual reports, 2015), with an annual growth rate of 5.2% (Bernard faye, 2013). Trypanosomosis is one of the main obstacles to the full development of the camel farming in the Kingdom. The understanding of the seasonal population dynamics of biting flies is important because the different species vary in their potential to cause annoyance (Jacquet et al., 2014).

A knowledge of the seasonal abundance patterns allows identification and anticipation of periods when these insects create the greatest stress, and when intervention to minimize their impact are advisable. *T. evansi* is transmitted mechanically, non-cyclically, by haematophagus flies such as stable flies which have worldwide distribution (Eyob and Matios, 2013). The distribution, abundance and population dynamics of biting flies influence the risk of surra transmission. Both males and females of the species of *Stomoxys calcitrans* are blood-sucking ectoparasites of farm animals and humans. During feeding stable flies transmit to hosts pathogenic viruses as Rinderpest, Rift valley fever, Equine infectious anemia, bacterial diseases, protozoal diseases such as Trypanosomosis and helminth parasites (Baldacchino et al, 2013). The painful bites of *Stomoxys* flies also influence parameters of fitness and production in farm animals. These include reduction in weight gain, milk production, feeding and feed conversion rates and traction power.

There are several traps designs used for catching biting flies. One of the efficient types of traps used for catching *Stomoxys* is NZI which is also a very effective trap for stable flies and horse flies, (Mihok, 2006). In addition,

attractants such as carbon dioxide (CO₂) may improve capture rates, but relative responses to different attractants may vary among species (Beresford and Sutcliffe 2008, Schofield et al., 1997). Acetone may be useful for increasing catches of *Stomoxys* species under certain conditions or release rates, (Mihok et al, 2007).

Therefore, the objective of the current study is to determine camels trypanosomosis prevalence in Al Kharj, Saudi Arabia and to update the base line data available for the distribution of biting flies in study area.

Materials and Methods:

Study area:

This study was conducted in Al-Kharj town, Central part of Saudi Arabia (24°8'N and 47°18'E), during the period, January to October 2016 (Fig.1). The climate in the study area is characterized by hot dry season (May-September) and a cool season (October-March) with few rain showers in the cool season.

Collection and process of samples:

Convenience sampling was employed in this study, (Thrusfield, 2005) according to the availability of the camel herds. In this study, 107 camels from different locations in the area were sampled. Blood samples were collected in tubes without anti-coagulants and centrifuged at 5000 rpm for 15 minutes to separate serum for CATT/test.

Collection of biting flies:

Eight NZI traps, 1-m triangular traps made from phthalogen blue and black cotton and white polyester mosquito netting (Mihok, 2002) were used for sampling of biting flies in this study (Plate 1). The Nzi trap was designed for tsetse, stable flies and tabanids, (Mihok *et al* 2006). The trapping sites selected for sampling flies were camels, cows and sheep pens, water treatment station, people residence, a cactus farm, irrigated areas, open Range, and behind barns.

Attractants: Carbone Dioxide (CO₂) and acetone were used as attractants. CO₂ was released from cylinders situated near traps at a release rate of (200 ml/h) via a regulator. The traps were baited with acetone (SIGMA-ALDRICH chemie GmbH) in 20 ml vials and the container caps were punctured with a nail. The evaporation rate was 150mg/h and the vials were placed on the ground near each trap.

The Survey Design

In each site the NZI traps were deployed for a period of three days every month from February to October. CO₂ was turned on at 09:00 hours each morning, and was turned off at 13: 30 hours. The flies were collected daily at 8:00 hours were taken to the laboratory and killed by chilling at – 20° C for one hour. Flies from all collected traps were preserved in 70 % alcohol.

All flies captured in the traps were identified according to Zumpt (1973). For confirmation, samples from the flies' were sent to the Entomology Department, Faculty of Food and Agriculture, King Saud University for further identification.

2-10 Statistical Analysis

Graph-Pad prism (windows version7.03) software was used for entomological data analysis (different trap sites, climate variables and the total numbers of muscids and mosquitoes).



Plate (1) NZI Trap diploid in Al-Kharj, Saudi Arabia in 2016.

Results

Based on CATT results, the prevalence of *T. evansi* infection in camels was 21.5 %.

No Tabanid flies were caught in the traps during the study period (Feb.2016-October 2016).

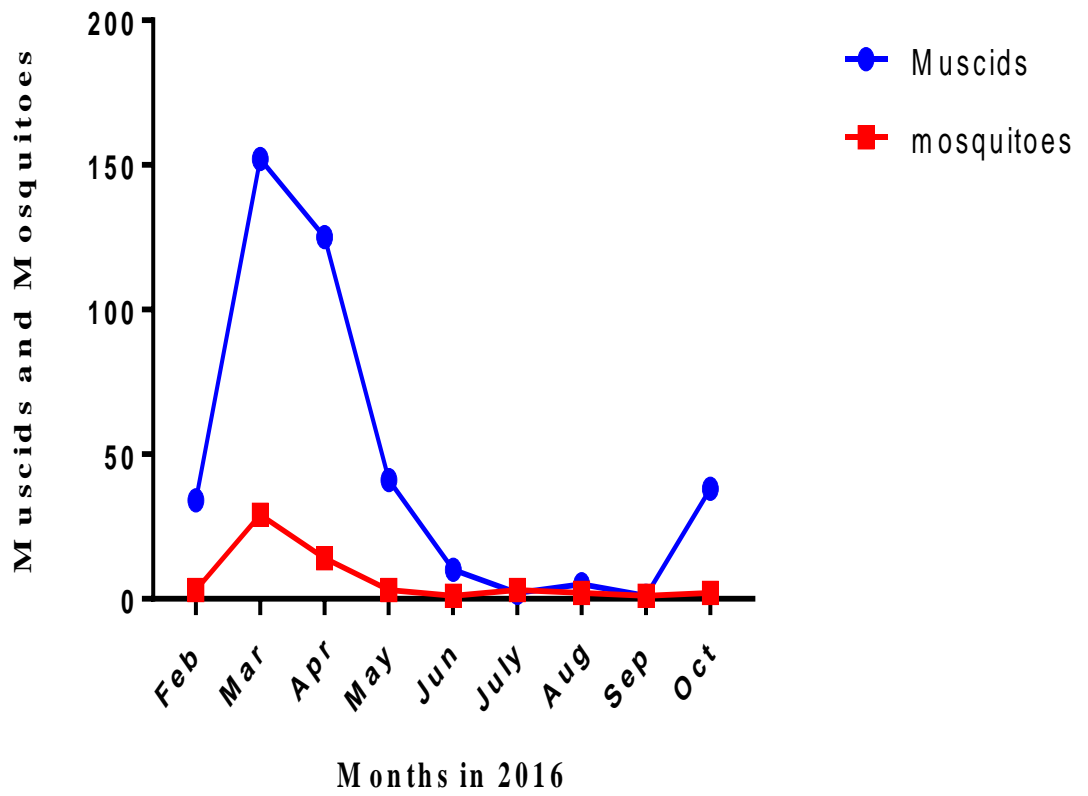
The traps caught flies that belonged to 7 families and 18 species as shown in Table 1. The majority of the species belonged to the family Muscidae among which *Stomoxys calcitrans* was the only biting fly species.

Few numbers of mosquitoes (Diptera: Culicidae), were also caught in the NZI traps. A peak of abundance was observed for muscids and mosquitoes in March and April (figure 2).

The high catches of flies were in the water treatment station and around people residence and the low catches were in Cactus farm, irrigated areas and open range respectively (Figure 1). Un-baited trap (control) also caught more flies during March and April (Figure 4).

Table (1) The catch composition of flies attracted to NZI traps in Al –Kharj, Al- Riyadh Region 2016.

Family	Species	References
Muscidae	<i>Stomoxys calcitrans</i> <i>Musca domestica</i> <i>Musca calleva</i> <i>Musca crassirostris</i> <i>Coenosia attenuata</i> <i>Musca sorbens</i> <i>Musca biseta</i> <i>Lispe</i> sp.	Linnaeus, (1758) Linnaeus, (1758) Walker, (1849) Stein in Becker, (1903) Stein in Becker, (1903) Wiedemann, (1830) Hough, (1898)
Calliphoridae	<i>Rhyncomya nigripes</i>	Séguy, (1933)
Ulidiidae	<i>Physiphora alceae</i> <i>Physiphora smaragdina</i>	Preyssler, (1791) Loew, (1852)
Sarcophagidae	<i>Wohlfahrtia nuba</i> <i>Chrysomya</i> <i>putoria</i>	Wiedemann, (1830) Wiedemann, (1830)
Stratiomyidae	<i>Aspidacantha atra</i>	Kertesz, (1916)
Psychodidae	Sand fly	
Culicidae	<i>Culex</i> sp <i>Aedes</i> sp	



Figure

(1) Seasonal abundance of Muscids and Mosquitoes in Al-Kharj, Riyadh Region 2016.

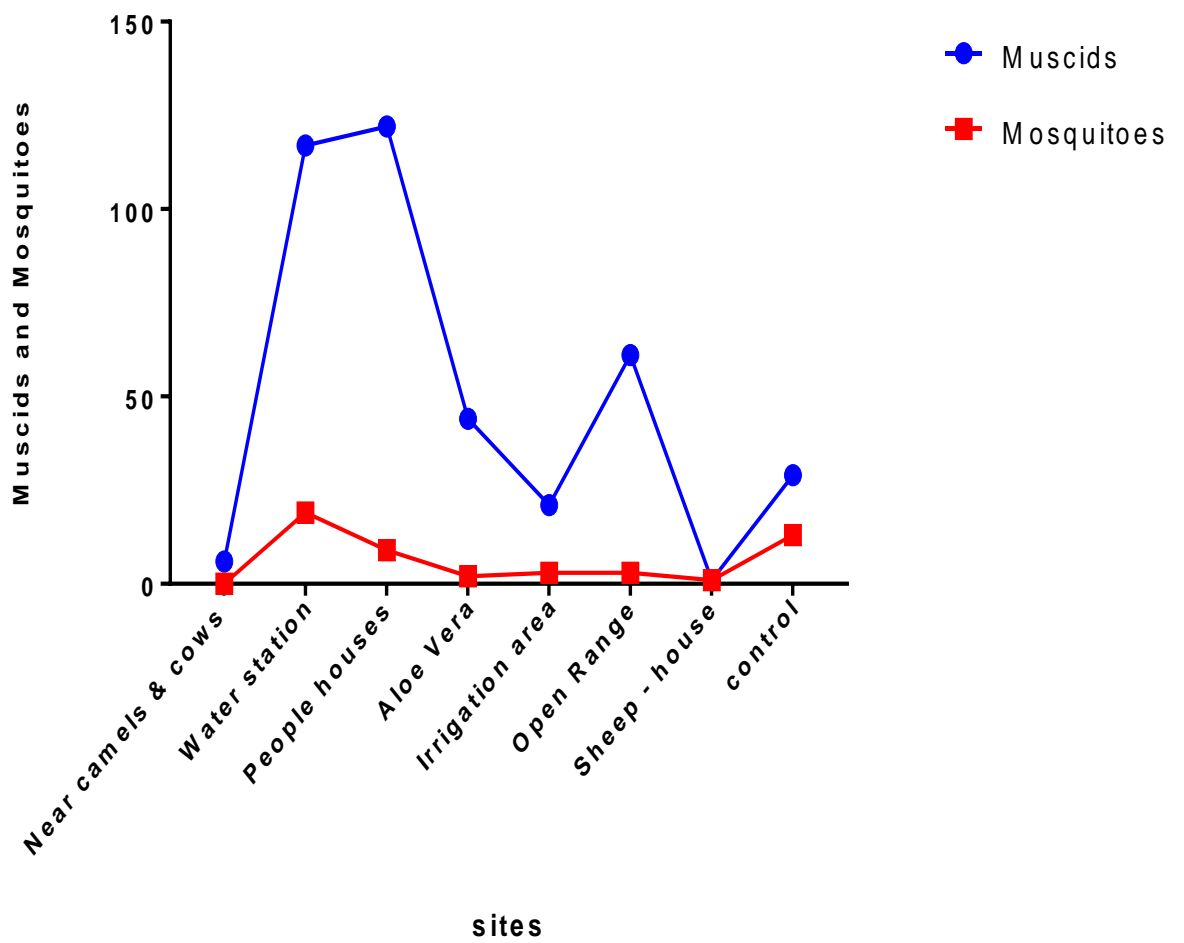


Figure (2) Total trap catches from different sites in Al-Kharj, Riyadh Region 2016.

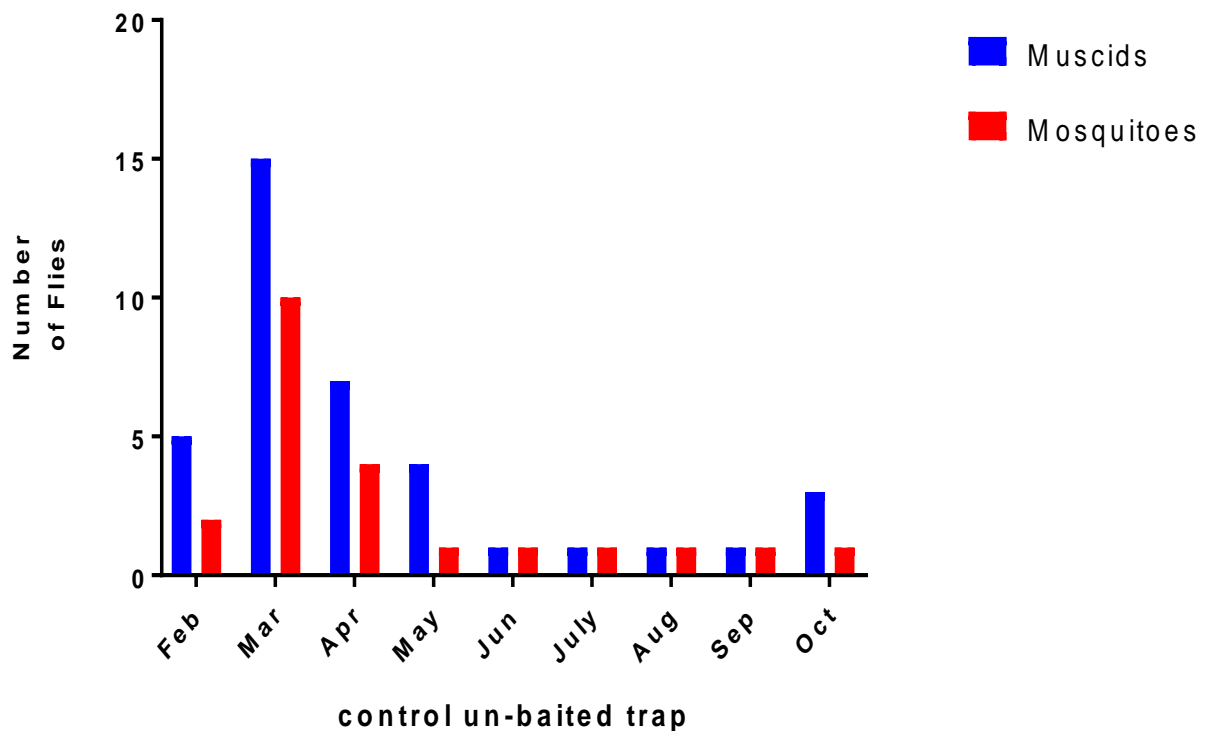


Figure (3) Seasonal abundance of Muscids and Mosquitoes collected by un-baited trap (control) in Al-Kharj 2016.

Discussion

The entomological study conducted in Al-Kharj area indicated that *Stomoxys calcitrans* and mosquitoes are the only biting fly species associated with camels in Al Kharj during the study period. Although the NZI trap is very effective sampling device for tabanids (Mihok, 2006), no tabanid flies were caught during this study. This might be due to the intensive use of insecticides applied in stagnant water surfaces that serve as suitable breeding sites of tabnids, while the breeding sites of *Stomoxys* were not sprayed (dung mixed with soil).

In this study, it was observed that the peak of seasonal activity of muscids and mosquitoes was in March and April (after the end of the rainy season in Al-Riyadh region). In fact, when the temperature is suitable, relative humidity can influence the abundance and seasonal activity of biting flies, through effect on the availability of breeding sites (Mellor *et al.*, 2000). In this study high catches of flies were from water treatment station and people resident more than other sites. These finding are similar the studies conducted by several authors who reported that stable flies are present in many habitats (Grimaud, 2013, Bitome *et al.*, 2015 and Zinga *et al.*, 2013). Indeed, the presence of stable flies is associated with unsanitary conditions and also present in anthropic environments.

The present results indicated that, *Stomoxys calcitrans* may be an important mechanical vector of camel *T. evasi* in Al-Kharj area. This is evidenced by the overall camel trypanosomosis prevalence of 21.5% among camels examined by CATT during this study. The elimination of *Stomoxys* breeding sites may help in reducing the risk of contracting camel trypanosomosis. The role of mosquitoes in mechanical transmission of camel trypanosomosis should be considered.

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