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Research Article

IXODID TICKS OF SHEEP IN EGYPT: PREVALENCE, SEASONAL DYNAMICS, AND ASSOCIATED RISK FACTORS

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ABSTRACT

The present study was conducted to identify the different tick species that infest sheep in some governorates of Egypt (Assiut, Sohag, Qena, and Aswan). As well as detection of the prevalence of tick infestation and a significant potential associated risk factors for infestation, such as; seasonal dynamics, age, sex, locality, breeding system, results revealed that, overall prevalence was (36.57%), and four stick species were identified; *Rhipicephalus sanguineus* (12.26%), *Hyalomma dromedarii* (8.35%), *Rhipicephalus tauranicus* (7.87%), and *Amblyomma vareigatum* (6.84%), hot season as Summer was a potential significant risk factor for infection (47.86%), younger suckling kids were significantly the highest infection rate (62.76%), and sheep grazed on free range system (45.08%) were significantly higher than housed animals, on the other hand; locality and animals sex had no any significant effect on infestation rate of tick species of sheep.

Keywords: Ticks, Sheep, Prevalence, Seasonal, Southern Egypt

INTRODUCTION

Hard ticks in sheep farms cause extensive and financial losses due to blood loss as a direct outcome of tick infection and disease transmission as an indirect effect on health status of sheep farms (Wharton et al. 1983). So; it is a mandatory to identify different species of ticks infesting sheep in specified locality to design adequate control measures of ticks and several tick borne pathogens at many countries in tropical and subtropical regions (Abdel-Rahman et al., 1998), especially in Egypt (El Kammah et al. 2001), also hard ticks play an important role in several pathogens transmission to sheep farms especially blood parasites as *Babesia spp*, and *Thieleria spp*, (Ramadan et al., 2016), and the identification of species of hard ticks is essential for control and preventive measures(Abdulaziz et al., 2019). The present study was conducted to identify hard tick species infecting sheep at southern Egypt governorates. As well as detection of the prevalence of tick infestation and a a significant potential associated risk factors for infestation, such as; seasonal dynamics, age, sex, locality, breeding system.

MATERIALS AND METHODS

Ethical considerations

The study protocol was carefully reviewed and approved by the local guidance of Research, Publication, and Ethics of the Faculty of Veterinary Medicine, Sohag University, Egypt, which complies with all relevant Egyptian legislations (2014).

Study area and animal data

One thousand, four hundred and sixty (1460) hard ticks samples were collected from local breed of sheep (485 adult, 975 kids, 761 female, and 699 male) from different localities at Egypt such as; Assiut, Sohag, Qena, and Aswan governorate during the period from January 2020 to February 2021.

Ticks collection and identification

Ticks collection was conducted by firmly grasping capitulum close with blunt forceps, after anesthetizing the ticks with ether. The collected ticks were collected in a clean labeled small plastic box with age, sex, locality, season, breeding system having air holes and transferred to the parasitology laboratory, Faculty of Veterinary Medicine, Sohag University for further identification. The collected samples were identified by taxonomic key of nymph and adult ticks in Egypt (Durden et al. 1996), (Walker et al. 1994), (Walker et al. 2003), (Estrada-Pena et al. 2004).

Statistical analysis

SPSS 22.00 software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) Prevalence results were expressed as a percentage of infected to all examined animals, Chi-square test was done to express the significance of results at 95% confidence level at ($P \leq 0.05$) between different variables categories (Fleiss et al. 1981).

RESULTS

As in Table 1, Figures 1 and 2, the overall prevalence of infection with hard ticks of 1460 total examined sheep under this prospective study was 534 positive infected (36.57%), and four hard tick species were recovered such as *Rhipicephalus sanguineus* (12.26%), *Hyalomma dromedarii* (8.35%), *Rhipicephalus tauranicus* (7.87%), and *Amblyomma vareigatum* (6.84%), in which a total of 699 males and 761 female sheep with 36.62% percent of infection in male

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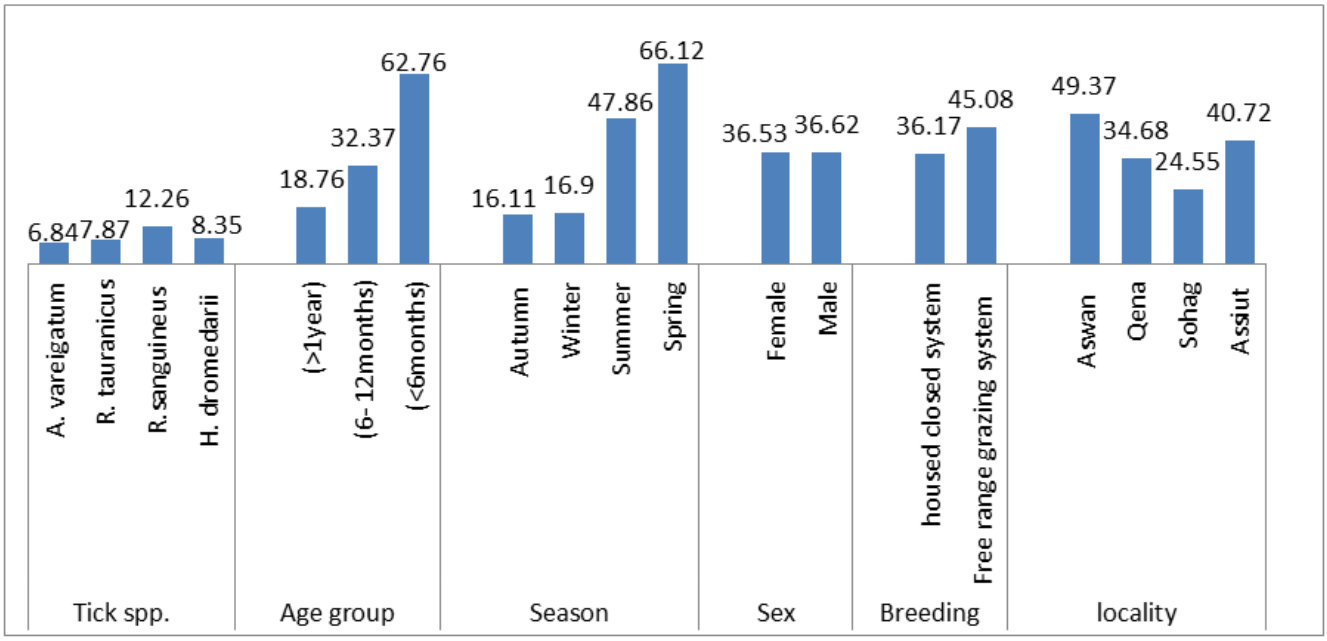
and 36.53% in female that was nearly equal and it was of no significant effect on prevalence. Ticks collection was conducted from different age groups; 419 suckling kids up to 6 months with (62.76%) percent of infection, also, 556 weaning sheep kids with a percent of infection of (32.37%), and 485 adult sheep over one year old with a percent of infection of (18.76%), and it seems that; younger animals suffer from a highest infection rate and it cleared that; age factor is significantly related to prevalence of infection with hard ticks in sheep at(p value ≤ 0.05) at 95% confidence as in table 1, it was (0.004)and Chi-square (x2)=(2.027). for seasonal dynamics of tick distribution, it was noticed that; the highest infection rate was in Spring (66.12%) followed by Summer season (47.86%), but Winter and Autumn seasons was nearly equal percent of infection (16.9%), and (16.11%) respectively, and it was cleared that; seasonal variation was significantly altered the pattern of prevalence of hard ticks in sheep at 95% significance level (p value ≤ 0.05) it was (0.0023), and Chi-square (x2)=(1.098).in this present study; there are four governorates were included, results concluded that; Aswan was the highest locality in which sheep was infested with hard ticks(49.37%), then followed by Assiut (40.72%), then Qena (34.68%), and the lowest percent was seen in Sohag (24.55%), these results were insignificantly affect the rate of infection of hard ticks in sheep at 95% significance level (p value ≤ 0.05) it was (0.7314), and Chi-square (x2)=(1.977). on the other hand; ticks samples were collected from sheep in two types of breeding system; either from sheep in free range grazing system or sheep reared in housed closed system and it was noticed that; tick infestation in sheep that reared on free range system was (45.08%) that was higher than sheep reared on housed closed system (36.17%), and it was considered a significant potential risk factor of tick infestation in sheep at 95% significance level (p value ≤ 0.05) it was (0.0214), and Chi-square (x2)=(2.987). so the potential associated risk factors for infestation with hard ticks of sheep in Egypt were; age of animals, seasonal variation, and type of breeding and rearing system of animals.

Table 2: *Prevalence, seasonal dynamics, associated risk factors of hard tick infestation in sheep at southern Egypt.*

Variables	No. exam.	No. infect	%	Chi-square (x2)	P-value
Overall infection	1460	534	36.57		
Age groups					
Suckling Kids (<6 months)	419	263	62.76	2.027	0.004
Weaned kids (6-12 months)	556	180	32.37		
Adults (>1 year)	485	91	18.76		
Sex of animal					
Male	699	256	36.62	1.959	0.139
Female	761	278	36.53		
Season					
Spring	369	244	66.12	1.098	0.0023
Summer	351	168	47.86		
Winter	349	59	16.90		
Autumn	391	63	16.11		
Locality					
Assiut	329	134	40.72	1.977	0.7314
Sohag	391	96	24.55		
Qena	418	145	34.68		
Aswan	322	159	49.37		
Breeding system					
Free range grazing system	721	325	45.08	2.987	0.0214
housed closed system	539	195	36.17		
Tick spp.					
Hyalomma dromedarii	1460	122	8.35	1.909	0.0608
Rhipicephalus sanguineus	1460	197	12.26		
Rhipicephalus tauranicus	1460	115	7.87		
Amblyomma vareigatum	1460	100	6.84		



Figures 1. *Prevalence, seasonal dynamics, associated risk factors of hard tick infestation in sheep at southern Egypt.*

Figures 2. *Egypt Map showing percent of infection of hard tick species of sheep in selected governorates (Assiut, Sohag, Qena, Aswan).*

DISCUSSION

The identified tick species under this study was *Rhipicephalus sanguineus*, *Hyalomma dromedarii*, *Rhipicephalus tauranicus*, and *Amblyomma vareigatum* at Southern Egypt which is considered one of the subtropical region in the world that triggers the continuity of hard ticks persistence in sheep farm due to the temperature and humidity is suitable along the year especially in summer and spring (El-Baky et al. 2001); these obtained hard tick species in this study is considered two and three host ticks that need another one or two other host to complete their life cycleas stated by (Sonenshine et al. 1993), so the collected samples from examined sheep under the study were usually in contact with camels or cattle or dogs or rodents in the same community either breed in closed housed system or free rearing and grazing system (Aydin et al. 2007), (Bouattour et al., 1999). In a previous study which was done by (Mohamed et al. 2000)at Marsa Matrouh, Sidi Barrani and Salloum, Egypt, on ixodid ticks infesting small ruminants (sheep and goats) to illustrate and identify hard tick species, it was found that; Sheep were found to be infested with two genera(*Hyalomma* and *Rhipicephalus*). The first genus (*Hyalomma*) included onespecies *H. dromedarii*, while genus *Rhipicephalus* included two species *Rhipicephalus sanguineus* sanguineus and R. tauranicus, and they found that; high infestation was in Summer and Spring than other seasons. (Amira et al. 2018), were conducted a study to identify the tick species of sheep at El Wadi Elgadid, Egypt, and they found the *Hyalomma anatolicumanatolicum* in all examined sheep. (Afaf et al. 2006) have studied the seasonal dynamic of ixodid ticks on domestic animals as (camels, goats & sheep, cattle, and buffaloes), and pet animals (dogs) at Imbaba, Giza governorate and El- Tal El- kebeer, Esmaieliya governorate for 2 successive years. The collected species of ticks were identified as: *Hyalomma dromedarii*,(50.8 %), *Hyalommn excavatum* (15.5 %), *Rhipicephalus sanguineus* (20.51 %), and *Amblyomma sp*. (3.9 %), that may be higher than the present study, and they found that; the tick population densities of adults in each species were relatively high during the period from June to Nov. that represent Summer hot season and it was in agreement with the present study, and it may be explained by the fact that stated that; hot humid environment is very suitable for oviposition of adult engorged female tick also it is suitable for moulting and ecdyses of larvae and nymph in soil, also they found that; the number of females in each species was higher than males, that on contrary to results of present study in which infestation rate was nearly equal in both sexes. In (Nady et al. 2014), has conducted an epidemiological study at Benisuef district to determine the current situation and associated determinants of tick infestations in sheep, the percent of infestation was (14.8%). The most prevalent tick's species affecting sheep was *Hyalomma anatolicum* (6.1%) then *Rhipicephalus tauranicus* (3.4%). Regarding the associated risk factors, tick infestation was found statistically significant ($P < 0.05$), as the highest infestation rates were recorded in older ages, >3 years (78.8%) followed by at age, 2 months (57.8%) and during summer months were found highly significant ($P < 0.01$) in sheep (33.3% and 22.9% resp.,) comparing with results in winter, that agree with present study that confirming that; summer season is a significant factor that trigger tick infestation especially in Egypt at southern regions due to the hot climatic condition and humidity that favour moulting of developmental stages of ticks and oviposition of engorged female ticks soil, on contrary; results of (Nady et al. 2014) belong to age factor was not in agreement with present study, they found that; older ages were more susceptible than young and this may be due to most of selected examined animals in their study were of older ages and younger were less included in the study, from this study it was found that; sheep breeds on free grazing system were of high susceptibility for tick infestation that sheep breeds on closed housed system and this may be due to less contact with other animals as dogs and camels or rodents that are essential host for completion of life cycle of these identified tick species, because they are two or three host ticks.

CONCLUSIONS

From the abovementioned data; we can conclude that;

1. *Rhipicephalus sanguineus*, *Hyalomma dromedarii*, *Rhipicephalus tauranicus*, and *Amblyomma vareigatum*are the main hard tick species of sheep in Egypt.

2. Seasonal dynamics, animals age, breeding system are the main risk associated factors for hard tick infestation in sheep.

3. locality of animals and animal sex have no any significant effect on hard ticks infection in sheep.

CONFLICT OF INTEREST

Authors declares that there is no any conflict of interest.

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