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Prevalence of ticks from buffaloes in different agro ecological zones of Punjab, Pakistan

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Abstract

Ticks are second to mosquitoes as vectors of a number of human pathogens and cattle globally affected like viruses, spirochetes, bacteria, rickettsia, protozoa and filarial nematodes etc. So, this study was carried out to check the prevalence of ticks from buffaloes in different agro ecological zones of Punjab, Pakistan. The collection of ticks was conducted in morning and evening during four seasons of the year 2016 to 2017. Ticks were collected systemically with the help of small forceps. In the laboratory, the process of preservation was carried out by keeping ticks into 50% alcohol. On the basis of morphology the collected ticks were identified microscopically with the help of dichotomous key. The prevalence of ticks was determined by using multiple logistic regressions and odd's ratio (OR) at 95% confidence level in different zones of Punjab. The results revealed that the overall prevalence of ticks in buffaloes was 37.52% (1201/3200) from Punjab while the highest tick population was recorded from central zone of Punjab, Pakistan. The total nine tick species were identified but *Hy. anatolicum* and *Hy. marginatum* were the most abundant ticks species. The highest tick infestation was recorded during summer season and least during winter.

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Introduction

The livestock plays a major role in Pakistan's rural economy. It is realized from the fact that 30-35 million rural population is involved in livestock raising which helps them to obtain their earnings from it (Ashraf *et al.*, 2013).The diseases which are related to parasites of different types are the prime disorder which badly affects the production performance of animals. Parasites may be endo-parasites (hookworm and tapeworm) that live inside the animals or ecto-parasites (ticks, mites, flies, fleas, midges) which attack on the body surface (Admassu *et al.*, 2015). Among ecto-parasites, ticks are obligatory blood-sucking ectoparasites infecting mammals, birds, reptiles and amphibians (Ali *et al.*, 2016).Due to ticks and tickborne diseases (TTBDs) the global loss was estimated to be between US$ 13.9 and 18.7 billion annually (Gosh and Nagar, 2014).Ticks cause these economic losses to livestock production by affecting the hosts in numerous ways such as deterioration of the quality of hides and skin, loss of blood and by transferring different viral and protozoan diseases to other animals (Ashfaq *et al.*, 2015).

Today, zoonotic pathogens are responsible for the most emerging infectious diseases which are transmitted by tick vectors. Ticks are second to mosquitoes as vectors of a number of human and cattle pathogens (Gosh and Nagar, 2014; Kaur *et al.*, 2015). Ticks borne infestation are a worldwide problem and considered as a major hurdle in the health and production of livestock which cause significant financial losses (Kemal *et al.,* 2016). Ticks encompass a very strong veterinary problem as they spread diseases e.g. anaplasmosis, theileriosis, babesiosis, and trypanosomiasis and toxicosis (Kaur *et al.*, 2015). The distribution of ticks is cosmopolitan, but occurs mostly in tropical and subtropical areas (Jabbar *et al.*, 2015). Pakistan is a tropical country which provides favourable environmental conditions for growth and multiplication of ticks. Tick fauna of Pakistan is rich in number of genera and species (Jabbar *et al.*, 2015). In Pakistan, the overall rate of tick infestation has been detected about 50%. Therefore, few studies have been conducted related to prevalence of tick infestation, taxonomy and acaricidal activity (Ali *et al.*, 2016) from a very limited area (Sajid *et al.*, 2008).In Pakistan especially in Punjab; being the largest province with respect to the population there is need to check the prevalence of tick species in Punjab, Pakistan.

Materials and methods

The study entitled prevalence of ticks in Punjab, Pakistan was carried out in Research Laboratory of the Department of Zoology, Government College University Faisalabad. The study was conducted to check the prevalence of ticks in buffalo farms. The research work was conducted from 2016 to 2017 in four different seasons (Autumn, Winter, Spring and Summer). This study was carried out from different zones of Punjab, Pakistan. All the randomly selected districts from different zone of Punjab are important livestock farming zone. In province Punjab the larger populations of livestock are occurred as compared to the other provinces of the country. The zones of Punjab are mostly dependent on agriculture for its economy.

Collection and preservation of ticks

Ticks were collected during four seasons of the year in morning and evening. Tick species were collected from buffaloes. Total 10 livestock farms (05 urban and 05 rural) were randomly selected from each selected district of the zones of Punjab. In urban areas, each farm was at least 10km apart from the other farm. While in rural areas, each farm was selected from different villages that were at least 5km apart. The selected 5-10 animals (if any animal was not available at the farms, then it was observed from nearly farm) were systematically observed from farms by close examination, parting the hairs against their natural direction for the recognition of ticks. Tick species were collected systematically from head to tail directions with the help of small steel forceps with blunt ends without damaging their mouth. Ticks were placed in clean and dry appropriately labeled plastic bottles covered with muslin cloth for proper aeration. Tick samples were taken to research laboratory for

identification of tick species. Complete record of the area, animal species, time and season was maintained. In the laboratory, the process of preservation was carried out by keeping ticks into 70% methanol for the identification.

Identification of ticks

Collected ticks were observed under low power and then high power magnification of microscope. Identification of different adult ticks were accomplished with the help of the anatomical and morphological features in the laboratory using dissecting and compound microscopes according the keys given(Mc Carthy,1967). Ticks were identified at the species level under a stereomicroscope (OPTICA SZM-1: Italy) with 40-fold magnification. For the identified tick genera abbreviations were used as earlier recommended (Dantas-Torres, 2008).

Statistical analysis

The prevalence of ticks was determined by using multiple logistic regressions and odd's ratio (OR) at 95% confidence level in different zones of Punjab, Pakistan. All statistical analysis were held using SAS software package (SAS, 2010).

Results and discussion

In the present study total 3200 buffaloes were examined in 120 livestock farms in twelve districts of Punjab, Pakistan.

The results revealed that the overall prevalence of ticks in buffaloes was 37.52% (1201/3200). The highest prevalence of *Hy. anatolicum* (24.05%) followed by *Hy. marginatum* (17.73%), *Rh. appendiculatus* (12.73%) and the least was *Hy. trunctaum* (3.62%) as shown in Table 1.

Table 1. Prevalence of identified tick species in different zones of Punjab, Pakistan.

Ticks species	Southern NAE/NAI/NTC	Western NAE/NAI/NTC	Central NAE/NAI/NTC	Northern NAE/NAI/NTC	Tick species (%)
	800/283/1265	800/304/1689	800/364/1271	800/268/692	
Hy. Anatolicum	265	356	356	206	24.05
Hy. Marginatum	196	234	232	210	17.73
Hy. Dromeddari	210	0	123	0	6.77
Hy. Trunctaum	0	178	0	0	3.62
Hy. Rufipes	0	193	0	0	3.92
Rh. Sanguineus	234	256	178	131	16.24
Rh. Appendiculatus	170	237	219	0	12.73
B. microplus	125	159	161	145	11.99
B. decolaratus	65	76	0	0	2.86

NAE= Number of animals examined, NAI= Number of animals infested, NTC= Number of ticks collected.

The highest prevalence was observed in Central zone (63.5%) during summer season and lowest in Northern zone (15.50%) during Winter season as shown in Table 2. The prevalence of ticks in buffaloes in all seasons and zones were observed highly significant ($p<0.00$).

The current study had been conducted in four seasons in different agro-ecological zones of Punjab to examine the prevalence of ticks in animals. The prevalence results of present study were in line with the findings of Iqbal *et al.* (2013) who reported 31% prevalence of tick species from Pakistan. However, the prevalence results of this study were in contrast with the results (Mustafa *et al.,* 2014) who reported 85% in Sargodha district Punjab, Pakistan. This difference in the prevalence of ticks could be due to the variation in climatic and geographical situations of the study zones, study periods, target populations and farming practices (Iqbal *et al.*, 2013). It was reported that in last few years, the ticks' prevalence in different regions of the province Punjab had been increasing rapidly which could be due to the resistance of acaricides (Ali *et al.*, 2013; Mustafa *et al.*, 2014). The prevalence was considerably higher in the Central region in current study due to highly

temperature that offered optimum situations for the multiplication of tick than the Northern region where temperature was low.

During the present study, the ticks prevalence was 37.53% in buffaloes which is statistically at par with the findings (Perveen *et al.*, 2011) who also reported 40.1% in northern areas of Pakistan. The results of this findings were contradict with (Mustafa *et al.,* 2014; Rehman *et al.*, 2017), who reported prevalence of ticks in buffaloes 84.3% & 81.44% respectively, in Punjab (Sargodha district), Pakistan while the results of current study were somewhat different (Khan *et al.*, 2013; Soomro *et al.*, 2014; Ali *et al.,* 2016), who reported prevalence of ticks 62.03%, 51.03%, 52.5%, 24.75%, and 51.65%, respectively in Pakistan.

Table 2. Season-wise prevalence with respect to different zones for buffaloes.

Zone	Season	Total	Infected	Prevalence (%)	Odds Ratio	Confidence Interval 95%		P-value
						Lower limit	Upper limit	
Southern	Spring	200	87	43.50	3.392	2.155	5.337	0.000
	Summer	200	102	51.00	4.585	2.918	7.205	0.000
	Autumn	200	57	28.50	1.756	1.097	2.812	0.019
	Winter	200	37	18.50				
Western	Spring	200	91	45.50	3.678	2.339	5.783	0.000
	Summer	200	111	55.50	5.494	3.493	8.642	0.000
	Autumn	200	65	32.50	2.121	1.334	3.372	0.001
	Winter	200	37	18.50				
Central	Spring	200	101	50.50	3.514	2.280	5.415	0.000
	Summer	200	127	63.50	5.992	3.862	9.298	0.000
	Autumn	200	73	36.50	1.980	1.276	3.072	0.002
	Winter	200	45	22.50				
Northern	Spring	200	75	37.50	3.271	2.028	5.276	0.000
	Summer	200	109	54.50	6.530	4.067	10.483	0.000
	Autumn	200	53	26.50	1.966	1.198	3.225	0.007
	Winter	200	31	15.50				

(P<0.05) significant.

In the current study total 09 different ticks species were identified i.e. *Hy. anatolicum, Hy. marginatum*, *Hy. dromedarii*, *Hy. truncatum*, *Hy. rufipes*, *Rh. sanguineus*, *Rh. appendiculatus*, *B. microplus*, *B. decolratus* respectively. The ticks were identifyed on the basis of their morphological characters. The identification of ticks in present study showed that *Hy. anatolicum* species was most abundant in study areas. The findings of current study were in agreement (Sajid *et al.*, 2008; Perveen *et al.*, 2011; Ali *et al.*, 2013; Iqbal *et al.*, 2014;Karim *et al.,* 2017; Riaz *et al.*, 2017; Rehman *et al.*, 2017) who reported the high infestation rate of *Hy. anatolicum* in different areas of the Punjab, Pakistan. The results of present study revealed that the tick species *B. microplus* was observed from all agro-ecological zones which is in line with the findings (Khan *et al.*, 1993; Gosh *et al.*, 2007; Perveen *et al.*, 2011; Mustafa *et al.*, 2014; Iqbal *et al.*, 2014; Karim *et al.*, 2017) who also reported *B. microplus* in the region of Punjab, Pakistan.

Hy. marginatum was also detected from the study area Punjab; Pakistan. The findings of present study were in line with the findings (Gosh *et al.*, 2007; Mustafa *et al.*, 2014; Iqbal *et al.*, 2014) who also reported the presence of *Hy. marginatum* in Punjab, Pakistan.

The result of current study was also in agreement with the findings (Hosseini-Chegeni *et al.*, 2013; Gharekhani *et al.*, 2015) who reported *Hy. marginatum* from Iran. *Hy. dromedarii* was

observed in the present study but *Hy. dromedarii* is limited to Bhakar and Bahawalpur district in the Southern and Western zone. The most part of Bhakar and Bahawalpur district comprises on deserts where the production of camel was common and *Hy. dromedarii* species of tick is particular to feed on camel. Therefore, the presence of *Hy. dromedarii* in buffaloes might be transferred from camel. The results of my findings were similar with the findings (Gosh *et al.,* 2007; Perveen *et al.*, 2011; Karim *et al.,* 2017; Rehman *et al.*, 2017) who reported *Hy. dromedarii* species in Pakistan. *Hy. truncatum* and *Hy.rufipes* were found only in Western Punjab, Pakistan which was not reported in other zones these findings were in line with the study (Gosh *et al.*, 2007) who reported *Hy. truncatum* and *Hy.rufipes* from Pakistan and also in line with the findings (Karim *et al.*,2017) who reported *Hy. truncatum* in Punjab, Pakistan. In present study *Rh. sanguineous* specie was identified which was in line with the findings (Khan *et al.*, 1993; Mustafa *et al.*, 2014; Karim *et al.*, 2017; Riaz *et al.*, 2017) who also reported that presence in Punjab, Pakistan. The *Rh. appendicluatus* was identified from the 3 zones expect Northern zone which may be due to the variation in climatic and geographical conditions. Earlier this species was reported only in one study (Gosh *et al.*, 2007) in Pakistan. The *Rh. decolratus* was identified from the current study areas but in previous study this species was not described.

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