



Persian J. Acarol., 2022, Vol. 11, No. 1, pp. 159–162.
<https://doi.org/10.22073/pja.v11i1.70976>
Journal homepage: <http://www.biotaxa.org/pja>



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Identification and new records of tick species on livestock from district Dera Ismail Khan, Pakistan

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PAPER INFO.: Received: 31 August 2021, Accepted: 15 October 2021, Published: 15 January 2022

Pakistan is an agricultural country divided into four provinces (Punjab, Balochistan, Sindh and Khyber Pakhtunkhwa). Livestock plays a key role in the economy of Pakistan in the form of skin, wool, hides, milk and meat products (Ramzan *et al.* 2021) and is considered the main source of income for poor people. According to the economic survey of Pakistan in 2017–2018, total livestock population of the country consisted of buffalo (37.7 million), goats (72.2 million), sheep (30.1 million) and cattle (44.4 million). Despite a large population of livestock, their production is considerably lower than in other countries such as China and India due to many biotic and abiotic factors including tick-borne diseases. Livestock in Pakistan is highly infested with ectoparasites (mosquitoes and ticks) and endoparasites (gastrointestinal and haemoparasites).

Among ectoparasites, ticks are the main threat for livestock industry in Pakistan (Farzana *et al.* 2010), due to wide habitat use and broad diversity of mammalian and avian hosts. Tick distribution and infestation are increasing day by day due to change in climate and biodiversity.

It has been reported that more than 60% of human population in rural areas is directly or indirectly engaged in livestock and milk production as their main source of income. Pakistan is the third ranked country in milk production after China and USA but now due to high tick burden milk production is reducing contributing to the poverty in the country. Migration, trade, transport, sale and purchase of livestock, especially during days of Eid ul-Adha, causes transmission of various tick species to domestic animals, because in these days animals are kept at one place for sale purposes, increasing the risk of transmission of diseases or infestations by ticks.

Ticks not only cause milk reduction but also help the spread of very contagious protozoal, viral and bacterial diseases, especially Crimean-Congo Hemorrhagic fever (CCHF) which is an important

How to cite: Ullah, N., Jamil, M., Ramzan, M., Arshad, A. & Zeeshan ul Haq, M. (2022) Identification and new records of tick species on livestock from district Dera Ismail Khan, Pakistan. *Persian Journal of Acarology*, 11(1): 159–162.

threat to public health (Adams *et al.* 2016; Ramzan *et al.* 2018). Due to tick infestation, many CCHF patients are reported every year in Pakistan during and after Eid ul-Adha. Ticks have become the main threat to human population and chances of introduction of invasive species or emergence of new tick species are greatly enhanced these days.

There is a need to collect ticks from different areas, body parts of animals and identify them to species level. By keeping in view the importance of such study, the current research was conducted before and after Eid ul-Adha 2021. The main aim of the current study was to identify tick species found on domestic animals in the study area.

Six tick species belonging to three genera were identified in the current study. Four species i.e. *Dermacentor marginatus* (Sulzer, 1776), *Hyalomma hussaini* Sharif, 1928, *Hy. anatolicum* (Koch, 1844), and *Haemaphysalis punctata* Canestrini & Fanzago, 1878 already existed in the study area while the other two species, i.e. *D. silvarum* Olenov, 1931 and *Ha. spinulosa* Neumann, 1906, were identified for the first time (Table 1). These two species are new records for the country. *Hyalomma anatolicum* was the dominant species collected from all hosts (cattle, buffaloes, goats and sheep) while the newly recorded species (*D. silvarum* and *Ha. spinulosa*) were collected from sheep and goats (Table 2).

Table 1. Tick species collected during the study period (August 2020–July 2021) from different sites.

Species	Study area			Tick sex		Total
	Dera Ismail Khan	Daraban	Kulachi	Male	Female	
<i>D. marginatus</i>	29	23	14	29	37	66
<i>D. silvarum</i>	3	1	1	2	3	5
<i>Ha. pinulosa</i>	4	2	2	3	5	8
<i>Ha. punctata</i>	27	7	6	23	17	40
<i>Hy. hussaini</i>	43	21	6	44	26	70
<i>Hy. anatolicum</i>	65	52	44	67	94	161
Total	171	106	73	168	182	350

Table 2. Tick species collected from different hosts.

Species	Hosts			
	Cattle	Buffalo	Sheep	Goat
<i>D. marginatus</i>	No	Yes	No	Yes
<i>D. silvarum</i>	No	No	Yes	Yes
<i>Ha. pinulosa</i>	No	No	Yes	Yes
<i>Ha. punctata</i>	Yes	No	Yes	No
<i>Hy. hussaini</i>	Yes	Yes	Yes	No
<i>Hy. anatolicum</i>	Yes	Yes	Yes	Yes

Ears and tails of goats and sheep were highly infested with ticks, while udder of cattle and buffaloes were found to be mostly infested. The maximum tick infestation was recorded on tail and udder of all hosts while minimum on testes and hooves (Table 3).

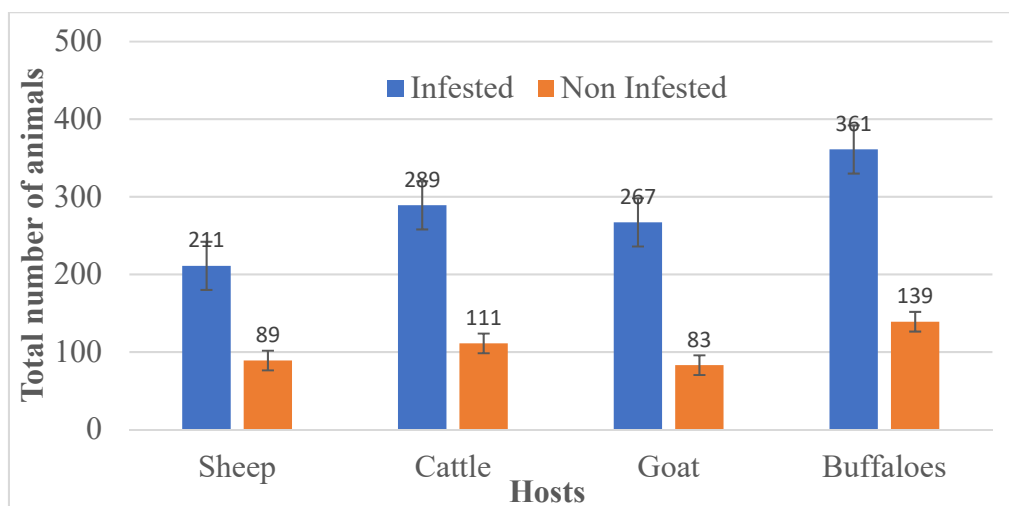
Ticks were mostly collected from females and babies than male and young animals. Highest tick prevalence was recorded on females and ≤ 4 years old animals while lowest on male and > 4 years old animals. It was observed that local animal breeds carried a greater number of ticks than cross-breeds (Table 4). Total number of infested and non-infested animals is shown in Figure 1.

Table 3. Attachment site of ticks.

Species	Attachment site (Body region)
<i>D. marginatus</i>	Tail, testes, brisket
<i>D. silvarum</i>	Udder, tail, ear
<i>Ha. pinulosa</i>	Udder, tail, ear
<i>Ha. punctata</i>	Tail, testes, brisket, ear
<i>Hy. hussaini</i>	Testes, hooves, tail, udder, dewlap, ear
<i>Hy. anatolicum</i>	Testes, hooves, tail, udder, dewlap, ear

Table 4. Prevalence of tick infestation (%) in relation to sex, breeds and age of animals

Parameters	Breed		Sex		Age	
	Local	Cross	Male	female	≤ 4 Years	> 4 Years
No. of screened animals	960	590	467	1083	439	1111
Prevalence %	56.1	52.12	68.52	70.90	85.42	73.89

**Figure 1.** Infested and non-infested hosts.

Livestock is the main reservoir of very contagious diseases caused by zoonotic pathogens. These pathogens are causative agents of various veterinary and human diseases (Jongejan and Uilenberg 2004; Ali *et al.* 2013). Many tick species transmit diseases to livestock, which indirectly and directly affect human. During feeding on human blood, allergy, irritation, pruritus and skin inflammation develops (Irshad *et al.* 2010).

According to Hussain *et al.* (2021), 30 tick species belonging to seven genera were identified from buffaloes and cows and 40 tick species infesting goats and sheep were recorded from different areas of Pakistan. In the current study two new tick species were identified which were collected from small ruminants (goats and sheep). These two species are an addition to the tick fauna in the country. Nine tick species including *Ha. punctata*, *D. marginatus*, *Rhiphicephalus sanguineus*, *Hy. aegyptium*, *Hy. excavatum*, *Hy. dromedarii*, *Hy. anatolicum*, *R. microplus* and *R. annulatus* were identified from rural and urban areas of Pakistan (Khan *et al.* 1993; Ramzan *et al.* 2020). This study could lead to new species in Pakistan. These two new species can transmit serious disease agents, which can result in huge economic loss. Many other species can also be recorded from livestock in Pakistan. Further studies are needed to identify the tick species from other areas of Pakistan.

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