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Identification of Tick Species on Angora Rabbits in Sothern's Areas of Khyber Pakhtunkhwa, Pakistan

**Muhammad Jamil¹, Noman Latif¹, Jaweria Gul², Mubarak Ali³, Norina Jabeen⁴,
Imtiaz Khan⁵, Imran Qazi⁶ and Fateh Ullah⁷**

1. PARC Arid Zone Research Center, Dera Ismail Khan, 29050-Pakistan
2. Department of Biotechnology, Shaheed Benazir Bhutto University, Sheringal, Dir, Pakistan.
3. Animal Science Institute, National Agricultural Research Center, Islamabad-54000-Pakistan.
4. Professor Rural Sociology, Department of Social Science Institute, University of Agriculture Faisalabad, Pakistan.
5. PARC Adaptive Research cum Demonstration Institute Miranshah-28200-Pakistan
6. PARC Adaptive Research cum Demonstration Institute Wana-29540-Pakistan
7. Department of Clinical Medicine, FVAS, University of Agriculture, Dera Ismail Khan, 29050-Pakistan

E-mail: jamilmatrah@gmail.com

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ABSTRACT

Angora rabbits are raised for commercial purposes, such as wool and fur production. These are also essential animals for performing various research or laboratory tests. Rabbits are susceptible to a wide range of ectoparasites and infections. Compared to non-infected rabbits, it leads to reduced body weight gain; even severe infection leads to death. Although rabbits are less prone to contract epidemic diseases, they are susceptible to parasite infections and diseases of care and malnutrition. The most common diseases infesting rabbits are coccidiosis, skin mange, stomach-worm infections and ear mange or ear canker. These caused due to lice, ticks, fleas and many other intestinal worms. Tick infection was observed in rabbits two years ago, but no one knows about their species. The current study aimed to identify the tick species found in angora rabbits. For this purpose, the present study was conducted. Six tick species belonging to five genera were identified, infested angora rabbits, including *Amblyomma variegatum*, *Amblyomma americanum*, *Dermacentor reticulatus*, *Hyalomma excavatum* *Ixodes ricinus* and *Rhipicephalus sanguineus*. The highest tick infestation was recorded on females than on males and kittens, while ears were the highly infested site of angora rabbits. This was the first study on angora rabbits related to tick species worldwide, especially in Pakistan. Further studies related to tick species are needed in rabbit-rearing countries, especially Pakistan. The current study results will be proved fruitful and give basic information about the tick of rabbits to the coming researchers.

INTRODUCTION

Rabbits are one of the most commonly utilized laboratory animals worldwide to explore various biological parameters. There are many rabbit species in Pakistan, but a new one, the Angora rabbit, was brought from Germany to meet Pakistanis' wool needs and conduct various studies on it. This rabbit species has expanded throughout Pakistan and is being raised on a large scale to obtain wool. This species is either kept or reared conventionally at animal facilities for use in scientific study, or it is available for commercial services in pet shops and backyard colonies.

Angora rabbit farming is a lucrative business that produces high-quality wool used to make warm clothing such as shawls, thermal underwear, and caps (Motamedi *et al.*, 2014). A variety of ectoparasites and endoparasites affect rabbits. Coccidiosis, ear mange or ear canker, skin mange, and stomach-worm infections are among the parasite disorders that rabbits should be aware of. Rabbits suffer from weakness, emaciation, wasting, and mortality due to these diseases. Other parasitic illnesses, such as tick irritants, may gradually weaken and debilitate them, rendering them more vulnerable to other ailments due to their diminished vigor (Frank *et al.*, 2013). Rabbits' hair loss and wool quality may suffer due to tick attacks (Sohail *et al.*, 2017; Sursal *et al.*, 2014; Szkucik *et al.*, 2014).

Ticks are ectoparasites of domesticated and wild animals all over the world mainly in tropical and subtropical areas, including Pakistan. These are vectors of several viral, protozoal, rickettsial and bacterial diseases (Jongejan and Uilenberg, 1994). These diseases can spread directly and indirectly to humans, animals, birds and wild fauna (Jamil *et al.*, 2022c).

Ticks are well-known for having a severe influence on animals (wild, domestic) and human health by infesting and transmitting a wide range of pathogens. In Pakistan, ticks infestation is the major problem faced by livestock keepers and these tick species remain the significant source for the spread of tick-borne diseases including Babesiosis, Anaplasmosis, Theileriosis, Ehrlichiosis, and Spirochaetosis (Jabbar *et al.* 2015; Rahman *et al.* 2022).

Ectoparasites are parasitic organisms that reside on the body of their hosts. Rabbit health must be considered, as ectoparasites in rabbits can harm breeders and their ability to breed quickly. Weight loss, hair loss, decreased production, discomfort, anaemia, and mortality can all be caused by ectoparasites (Elshahawy and Elgoniemy 2018). The tick species on angora rabbits is increasing day by day, resulting in the death of angora rabbits. Several kinds of research on the distribution and prevalence of parasites in various rabbit breeds, except for angora rabbits and indifferent world locations, have been published (Al-Mathal, 2008; El-Shahawi *et al.*, 2012). Unfortunately, there is a scarcity of data on the prevalence of ectoparasites like ticks in Pakistan (Yakhchali and Tehrani 2007).

This study aimed to determine tick species found on angora rabbits and how common they were in the study area of Pakistan. This is the first study on tick species found in rabbits, especially angora rabbits in Pakistan. No research has been done in Pakistan to identify the tick species that infest angora rabbits.

MATERIALS AND METHODS

Study Area:

The research was conducted from March to December 2020 in district Dera Ismail Khan (31° 49' 53.3352 N and 70° 54' 41.7528), including its tehsils, *i.e.* Dera Ismail Khan (D.I.Khan), Daraban and Kulachi to determine the tick species found on angora rabbits.

Tick Collection, Preservation and Identification:

A total of 250 specimens were collected from the various body sites of Angora rabbits, including the ears, tail, neck, brisket, dewlap, back, testes, and udder. During the trial, sampling was done twice a month. One thousand angora rabbits were inspected, including 600 females, 300 males and 100 kittens. The collected specimens were brought to the laboratory and preserved in 70% ethyl alcohol, identifying species levels using different morphological keys (Walker *et al.*, 2014; Jamil *et al.*, 2021a,b; Jamil *et al.*, 2022a,b,f).

RESULTS AND DISCUSSION

The literature was reviewed related to tick species on angora rabbits. According to data collected from different websites, no single study has been conducted related to ectoparasites, especially ticks of rabbits globally. This is the first study regarding tick species on angora rabbits throughout the world, especially in Pakistan. According to the American Rabbit Breeders Association (ARBA), there are five breeds of rabbits, English, French, Giant and Satin, and Satin. Angora rabbits have been imported from Germany to Pakistan full fill wool production and related products. The high-quality wool and its associated products can be obtained by rearing or farming angora rabbits on a small and large scale, increasing Pakistan's economy.

It was observed that various body parts, especially the ear, nose and tail of angora rabbits, were highly infested with ectoparasites. There was a need to identify these parasites so that proper control measures could be adopted to protect the rabbit's health and minimize the economic losses. Among ectoparasites, tick infestation was recorded highest. During the current study, six tick species belonging to five genera were caught from the study area. Angora rabbits were infested with *Amblyomma variegatum*, *Amblyomma americanum*, *Dermacentor reticulatus*, *Hyalomma excavatum*, *Ixodes ricinus* and *Rhipicephalus sanguineus* species in the study area (Table 1).

Table 1: Tick species collected from different tehsils and their prevalence.

Tick species	Tehsils			Prevalence
	D. I. K	Kulachi	Daraban	
<i>Amblyomma variegatum</i>	+	+	+	55 (22%)
<i>Amblyomma Americanum</i>	+	-	-	37 (14.80%)
<i>Dermacentor reticulatus</i>	+	-	+	29 (11.60%)
<i>Hyalomma excavatum</i>	+	-	+	66 (26.40%)
<i>Ixodes Ricinus</i>	+	+	-	22 (8.80%)
<i>Rhipicephalus sanguineus</i>	+	+	-	41 (16.40%)
Total number of ticks				250

Table 2: Sex wise tick infestation.

Hosts	Percentage of tick infestation		
	Male	Female	Kittens
Angora rabbits	295/400 (73.75%)	467/600 (77.84%)	69/100 (69%)

In the current study, 77.84% of tick infestation was recorded in females and 73.75% in males, while 69% in kittens, as shown in Table 2. The different body parts of rabbits showed that ears were the primary tick infestation or attachment sites, followed by

the tail, nostrils, neck, cheek, saddle, hind legs, forelegs, forehead and hip (Table 3). Ticks diseased rabbits are kept under laboratory conditions for inspection, as shown in Figure 1. Tick infestation on rabbit testes and ears is given in Figures 2 and 3. Tick infestation was recorded high in ears because ears are the sensitive parts and free from wool which becomes the best site for tick attachment. The wool on the rabbits provides the best environment for ticks for their attachment. Attachment sites on animals for ticks are given in Figure 4.

Several tick species feed on the blood of rabbits, but *Haemaphysalis leporisjoalustris* has been recorded most common specie in North America but is not found in the current study area. In the present study, an infestation of *Hy. excavatum* was 26.40% followed by *A. variegatum* (22%), *R. sanguineus* (16.40%), *A. americanum* (14.80%), *D. reticulatus* (11.60%) and *I. ricinus* (8.80%). These tick species can cause various serious diseases such as papillomavirus, myxomatosis and tularemia (Jackson and Chesternan, 1989; Jenkins, 2001; Ullah *et al.*, 2022).

Table 3: Ticks caught from different body sites of angora rabbits.

Body parts	Angora rabbits			Prevalence (%)
	Male	Female	Kittens	
Eye	0	0	0	0.00
Ear	168	306	51	52.50
Nostrils	14	16	17	4.70
Cheek	9	23	0	3.20
Neck	11	25	0	3.60
Hip	2	5	0	0.70
Tail	73	186	31	29.00
Fore legs	5	10	0	1.50
Hind legs	8	11	0	1.90
Saddle	7	13	0	2.00
Forehead	3	5	1	0.90
Total	300	600	100	1000



Fig. 1. Tick-attacked rabbits in the PARC AZRC farm.

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Fig. 2. Tick infestation on testes of rabbit.

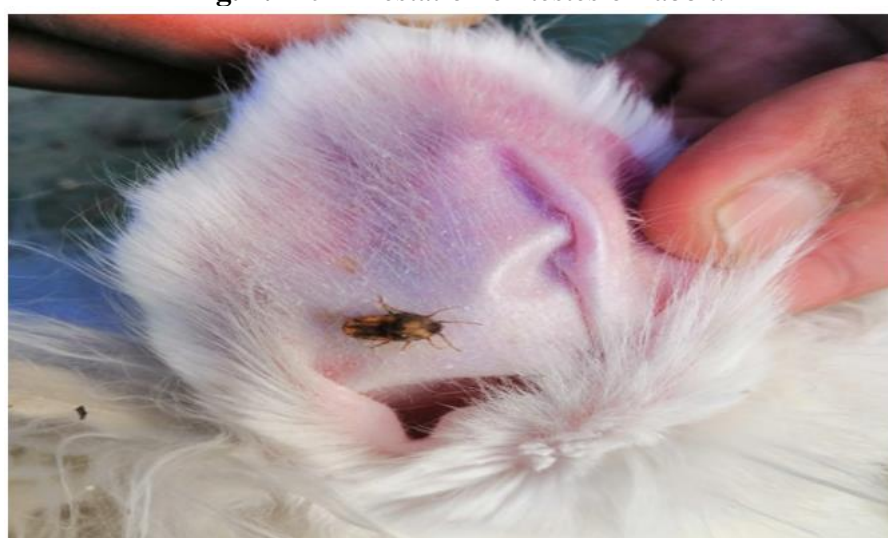


Fig. 3. Tick infestation on rabbit ear.

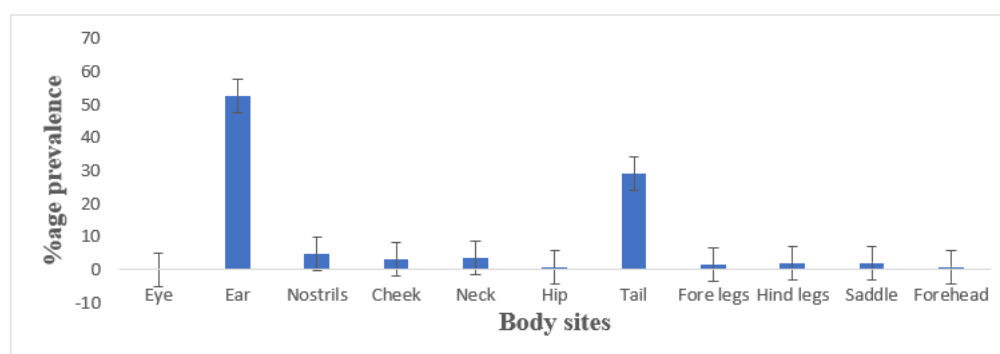


Fig. 4: Prevalence of tick attachment on different body sites of domesticated animals.

CONCLUSION

Angora rabbits are significant animals reared in laboratories and houses for meat production and performing experiments. This animal is very susceptible to various ectoparasites and endoparasites. Among ectoparasites, ticks are the major ones that highly affect the growth and development of angora rabbits across multiple world regions, especially in the current study area. The most abundant tick species found on rabbits in the

study area were *Amblyomma variegatum*, *Amblyomma americanum*, *Dermacentor reticulatus*, *Hyalomma excavatum*, *Ixodes ricinus* and *Rhipicephalus sanguineus*. The most distributed tick species was *Hyalomma excavatum*. The highest tick infestation was recorded on females than on males and kittens, while ears were the highly infested site of angora rabbits. However, the attention given to controlling the infestation had not been sufficient, even not applied in the country. There is a further need to determine the biology of a tick on rabbits and effective management strategies against ticks based on the distribution pattern of ticks.

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