



SYSTEMATIC STUDY OF HARD TICKS (IXODOIDEA: PARASITIFORMES) FROM LOWER SINDH, PAKISTAN

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ABSTRACT

Pakistan is an agriculture country. About 70% population of Pakistan living in rural area of country they depend directly or indirectly on livestock animals. Livestock sector suffering from many problems in which diseases are important factor towards reduction of meat and milk production and in severe cases animal can die. Ticks are notorious, obligate blood feeding ectoparasites that fulfill their nutritional value by sucking the blood of host animal. Hard ticks belong to family Ixodidae while soft ticks belong to family Argasidae. Hard ticks are cosmopolitan, their infestation founded worldwide on livestock. Purpose of our present study in four localities of lower Sindh is to find further more diversity of hard ticks infesting livestock, how much ticks are injurious to men and animals. Further more study will helpful to aware the local masses of study areas and recommended government about infestation and tick borne diseases.

1. INTRODUCTION

Pakistan is an agriculture country; economy of country depends upon agriculture and livestock sector. About 70% population of Pakistan living in rural area of country they depend directly or indirectly on livestock animals. Livestock included (Goats, Buffaloes and cattle). In Pakistan annual milk production recorded is 25.62 million in Punjab, 9.35 million in Sindh, 4.88 million in KPK and 0.81 million liters in Baluchistan [1]. Annual meat production recorded 1.28 million tons [2]. Due to increase in growing population in Pakistan these production of milk and meat are not sufficient for population. Livestock sector suffering from many problems in which diseases are important factor towards reduction of meat and milk production and in severe cases animal can die. The major diseases of livestock are Anaplasmosis, Babesiosis, Theileriosis and Cowdriosis and many other that are transmitted to livestock by tick infestation [3].

Ticks are notorious, obligate blood feeding ectoparasites that fulfill their nutritional value by sucking the blood of host animal. Ticks are members of phylum Arthropoda and belong to class Arachnida. Hard ticks belong to family Ixodidae while soft ticks belong to family Argasidae. Hard ticks are cosmopolitan, their infestation founded worldwide on livestock [4]. Total 900 species of ticks have been identified worldwide in which 700 species belongs to Ixodidae (hard ticks) and remainder short figure of 200 belongs to Argasidae (soft ticks). Climate change and number of host animal directly influence the distribution of ticks. Ticks founded in tropic region of world where climate is warm and humid [3]. World is facing serious consequences of tick infestation and today it becomes a threat to all agricultural countries those who totally rely on agriculture, damage to livestock directly and indirectly lowering the GDP of agricultural countries. 70% populations of Pakistan and other under developed countries are still unaware about tick infestation and how much it can be threatened to us.

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In Pakistan notable genera of hard ticks have been identified earlier by researchers, some genera are *Hyalomma*, *Rhipicephalus*, *Haemaphysalis* and some others too [6]. Purpose of our present study in four localities of lower Sindh is to find further more diversity of hard ticks infesting livestock, how much ticks are injurious to men and animals. Further more study will help to aware the local masses of study areas and recommended government about infestation and tick borne diseases.

2. MATERIALS AND METHODS

Present study was carried in four localities (Tando Ghulam Ali, Wali Muhammad Malkani, Tando Qaiser and Mirpurkhas city) belonging to three district of lower Sindh (Badin, Hyderabad and Mirpurkhas). The study areas are very rich in agriculture and live stock throughout the province. Huge number of livestock (Goats, Buffaloes and cattle) are inhabits in these areas. The climatic conditions of study areas are warm to moderate, temperature in summer recorded (27- 45°C) and in winter temperature ranged between (10- 27°C) [5]. Annual rain fall recorded is 152.4-177.8 mm per year [5]. Relative Humidity recorded 20-80 % [5].

For collection of hard ticks three most abundant animal including (Goats, buffalos, and Cattles) were selected for the present study on diversity of hard ticks. Specimen of hard ticks were collected for identification from soft body parts of host animal (head ,abdomen ,tail region) by the method of hand picking using polythene gloves ,forceps ,face mask and 10 ml vials filled with 70% alcohol for preservation of ticks for further study. For identification of tick species from collected material, all morphological features of each specimen of hard tick were examined under binocular microscope using identification keys in laboratory of department of zoology in university of Sindh. DSLR camera (Canon 60 D) was used to capture the photographs of all identified species of hard ticks from dorsal ad ventral side of both male and female of particular species for this research work in department of Zoology, university of Sindh.

3. RESULTS AND DISCUSSION

In present survey of all four localities of lower Sindh (Tando Ghulam Ali, Wali Muhammad Malkani, Tando Qaiser and Mirpurkhas) we have personally collected 204 specimens of hard ticks belonging to two genera, *Hyalomma* and *Rhipicephalus* 188 out of 204 specimens were belonging to genus *Hyalomma* and rest of the 16 specimen of hard ticks belonging to

genus *Rhipicephalus*. Six species of both genera have been identified. Most diverse and rich species was *Hyalomma dromedarii* that was found in all areas and most rare species was *Rhipicephalus zambeziensis*. 127 specimens were ♂ and 77 were ♀ in all collected data.

a) *Hyalomma dromedarii*

Hyalomma dromedarii also called camel tick because of direct association with camels but also parasitize other animals including Cattles, Goats, and Buffaloes. *H.dromedarii* attach to udder region, thigh region and on the nostrils of cattle. *H. dromedarii* has two to three hosts in a life cycle [4]. Head portion of *H. dromedarii* possesses mouthparts including paired elongate chelicerae, segmented palps and hypostome. Body of *H.dromedarii* is light brown to nearly dark brown in color. Dorsal side is nearly dark brown while ventral side is light brown in color. In male dark brown, broadly oval conscutum covering whole dorsal side, central festoons along with paracentral and sub triangular festoons are present. Legs are ringed by paler bands. The sub-anal plates in male are laterally placed. The lateral grooves are short and posterior-median grooves are narrow. Anal plates are also present in male. In female genital aperture is triangular and elongate. *H.dromedarii* is distributed in North Africa, west and east Africa, Arabia, Asia, Middle East and central Asia [7]. Total 166 specimens were collected, 109 out of 166 are ♂ while 57 out of 166 are ♀. 76 specimens were collected from Tando Ghulam Ali, 28 from Wali Muhammad Malkani, 44 from Tando Qaiser and 18 from Mirpurkhas.

Systematic position

Kingdom	Animalia
Phylum	Arthropoda
Class	Arachnida
Order	Parasitiformes
Family	Ixodidae
Genus	<i>Hyalomma</i>
Specie	<i>Hyalomma dromedarii</i>

b) *Hyalomma truncatum*

Hyalomma truncatum infest Goats, Sheep, Cattles, Horses and some domestic animals. They are attached on the hooves of sheep tail, thigh and anal region of Cattle [4]. Head portion of *H.truncatum* comprises long and broad chelicerae, ventrally situated hypostome and dorsally situated segmented palps. Body of *H.truncatum* is dark brown in color from both dorsal and ventral side. In male narrow, dark brown conscutum is present. Eyes are laterally placed. Festoons along with central festoons both are absent. In male narrow, dark brown conscutum is

present. Eyes are laterally placed. Festoons along with central festoons both are absent. In male Anal plates are square shaped, sub-anal plates are small and are aligned with Anal plates. In female genital aperture is semicircular in shape. Legs are dark brown in color with the presence of colored bands. Pair of Spiracles plates located posterior to fourth coxae, in each plate spiracle a single opening is present. *Hyalomma truncatum* is widely distributed in Asia, Africa and North America [8]. Total 15 specimens were collected. 10 out of 15 are ♂ while remaining 5 were ♀. 4 specimens were collected from Tando Ghulam Ali, 1 from Wali Muhammad Malkani, 7 from Tando Qaiser and 3 from Mirpurkhas.

Systematic Position

Kingdom	Animalia
Phylum	Arthropod
Class	Arachnida
Order	Parasitiforms
Family	Ixodidae
Genus	<i>Hyalomma</i>
Specie	<i>Hyalomma truncatum</i>

c) *Hyalomma rufipes*

Hyalomma rufipes infest Goats, Sheep, Cattles and other animals. Adult *H. rufipes* attached on those body regions of cattle where hairs are not present, especially near the genitalia and Anal region *H. rufipes* is the most efficient vector of disease Crimean Congo hemorrhagic fever in humans as compared to other vectors [4]. Head portion of *H. rufipes* comprises mouthparts. In male chelicerae are narrow and short while in female chelicerae are long and elongate. Body of *H. rufipes* is light brown to dark brown in color. Ventral side of both male and female is light brown while dorsal side of both male and female is dark brown in color. In male dark brown, oval conscutum is present, small eyes are laterally present, and Festoons are present. Brown legs with brightly colored rings are present. Genital aperture is v-shaped, sub-anal plates are small and Anal plates have square ends. Pair of Spiracle plates are present. *Hyalomma rufipes* found in wide range of habitats from desert to rainforest. Abundantly found in Asia, South Africa and West Africa [4]. Total 7 specimens were collected. 4 out of 7 were ♂ and 3 out of 7 were ♀. 3 specimens collected from Tando Ghulam Ali and 4 collected from Tando Qaiser.

Systematic Position

Kingdom	Animalia
Phylum	Arthropoda
Class	Arachnida

Order	Parasitiforms
Family	Ixodidae
Genus	<i>Hyalomma</i>
Specie	<i>Hyalomma rufipes</i>

d) *Rhipicephalus microplus*

Rhipicephalus microplus also called Asian blue tick. *R. microplus* infests Goats, Buffaloes and Cattles. It attaches on the thigh region and other soft body parts. *R. microplus* is the vector of disease Bovine Anaplasmosis and Babesiosis [11]. Head portion of *R. microplus* comprises mouthparts with very small paired chelicerae, segmented palps and dentition in hypostome. Body of *R. microplus* is brown to reddish color. Male are brown in color from both sides while female are reddish in color from both dorsal and ventral side. In female conscutum is limited and short. Lateral grooves are present on conscutum of male, Festoons are present on male body. In female thin legs are present while in male legs are much thicker. In male Anal plates with sub-anal plates are arranged in each line. In male genital aperture is elongate and in female genital aperture and anal groove both are circular in shape. *R. microplus* is widely distributed in Subtropical and tropical regions of Asia, northeastern Australia and Southeastern Africa. They are found in east and South Africa and Asia [11]. Total 13 specimens were collected. 4 out of 13 were ♂ and 9 out of 13 were ♀. 11 specimens were collected from Tando Ghulam Ali and 2 specimens were collected from Mirpurkhas.

Systematic Position

Kingdom	Animalia
Phylum	Arthropoda
Class	Arachnida
Order	Parasitiforms
Family	Ixodidae
Genus	<i>Rhipicephalus</i>
Specie	<i>Rhipicephalus microplus</i>

e) *Rhipicephalus appendiculatus*

Rhipicephalus appendiculatus also called Brown ear tick because it is found on the ears of Cattle, Buffaloes and other livestock, heavy infestation may cause damage to ears. *R. appendiculatus* is the vector of disease East coast fever in Cattle [9]. Head portion of *R. appendiculatus* consist of short and broad chelicerae, segmented palps and ventrally situated hypostome. Body of *R. appendiculatus* is uniformly brown in both male and female from both dorsal and ventral side. Large conscutum present on anterior portion of female. Median and lateral grooves are present. Small eyes are laterally situated. Festoons are present on male. In male Anal plates are long, genital aperture is semicircular in shape. In female

genital aperture is triangular and anal groove is circular in shape. Bright colored bands are present on legs. Pair of spiracle plates is present. *R.appendiculatus* found in cool and shaded places of eastern and southern Africa and Asia [9]. Total 2 specimens were collected, both were ♀. 1 ♀ collected from Wali Muhammad Malkani and other collected from Tando Qaiser.

Systematic Position

Kingdom	Animalia
Phylum	Arthropoda
Class	Arachnida
Order	Parasitiforms
Family	Ixodidae
Genus	<i>Rhipicephalus</i>
Specie	<i>Rhipicephalus appendiculatus</i>

f) *Rhipicephalus zambeziensis*

Rhipicephalus zambeziensis is also called Lower brown ear tick, resembles morphologically with *R.appendiculatus*. *R.zambeziensis* is found on livestock and other domestic and wild animals. In livestock Cattles are heavily infested by them. *R.zambeziensis* is the vector of disease being bovine Theileriosis in cattle [4]. Head portion of *R.zambeziensis* possesses mouth parts with broad and paired elongate chelicerae, segmented palps dorsally and ventrally situated hypostome. Body of *R.zambeziensis* is light to dark brown in color in both male and female from both dorsal and ventral side. In male brown conscutum is covering whole dorsal side. In female conscutum is broad. Festoons and eyes both are absent. In male genital aperture and Anal groove both are circular in shape. Anal plates and sub-anal plates are present. In female genital aperture is semicircular in shape while anal groove is circular in shape. Brightly colored rings are present on legs. Spiracle plates are present. *R.zambeziensis* prefers hotter and drier regions with presence of appropriate hosts. It is found in eastern and southern Africa and Asia [10]. Total 1 ♀ was collected from Tando Ghulam Ali.

Systematic Position

Kingdom	Animalia
Phylum	Arthropoda
Class	Arachnida
Order	Parasitiforms
Family	Ixodidae
Genus	<i>Rhipicephalus</i>
Specie	<i>Rhipicephalus zambeziensis</i>

During present study carried out in four localities of lower Sindh (Tando Ghulam Ali, Wali Muhammad Malkani, Tando Qaiser and Mirpurkhas) six species

of hard ticks were found from all study localities. *Hyalomma dromedarii* was most abundant specie in all six species and observed on all host in all localities. Total 166 specimens out of 204 were belonged to *H.dromedarii*. *Hyalomma truncatum* and *Rhipicephalus microplus* were 2nd most abundant species after *H.dromedarii*, total 15 and 13 specimens collected respectively. *Rhipicephalus appendiculatus* and *Rhipicephalus zambeziensis* were least abundant species, total 2 and 1 specimens collected respectively.

4. CONCLUSION

During present study six species of hard ticks *Hyalomma dromedarii*, *Hyalomma rufipes*, *Hyalomma truncatum*, *Rhipicephalus microplus*, *Rhipicephalus appendiculatus* and *Rhipicephalus zambeziensis* belonging to two genera *Hyalomma* and *Rhipicephalus* of family Ixodidae were collected from all study areas. Total 204 specimens of hard ticks were collected out of these 127 were male and 77 were female. *Hyalomma dromedarii* was the most abundant species during the whole study period total 166 (81%) recorded in all study areas. *Rhipicephalus zambeziensis* was least abundant specie during study period and only one specimen of this species was collected and that was female. During present study Male population recorded high as compare to female population ratio recorded (Male is 62% and female is 37%). Localities wise maximum collection of species collected from Tando Ghulam Ali and *Hyalomma dromedarii* was most abundant and prevalent in all localities. Most attractive host towards ticks infestation in all localities were goats 48% and total 44% infestation of ticks found on goats. Ticks infestation observed highest in traditional farms as compare to animal sheds. The rain fall and humidity effect positively on ticks population and prevalence. During present study July to August highest rainfall recorded as compare to previous years of recorded rainfall data. So present study revealed rainfall and humidity are positively correlated with ticks' infestation.

5. CONFLICT OF INTEREST

All authors have declared that there is no conflict of interest regarding publication of this article.

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Fig. No.3.1 *H.dromedarii* Dorsal view of male



Fig.No.3.2 *H.dromedarii* Ventral view of male



Fig.No.3.3 *H.dromedarii* Dorsal view of female



Fig.No.3.4 *H.dromedarii* Ventral view of female



Fig.No.3.5 *H.truncatum* Dorsal view of male



Fig.No.3.6 *H.truncatum* Ventral view of male



Fig.No.3.7 *H.truncatum* Dorsal view of female



Fig.No.3.8 *H.truncatum* Ventral view of female



Fig.No.3.9 *H.rufipes* Dorsal view of male



Fig.No.3.10 *H.rufipes* Ventral view of male



Fig.No.3.11 *H.rufipes* Dorsal view of female



Fig.No.3.12 *H.rufipes* Ventral view of female



Fig.No.3.13 *R.microplus* Dorsal view of male



Fig.No.3.14 *R.microplus* Ventral view of male



Fig.No.3.15 *R.microplus* Dorsal view of female



Fig.No.3.16 *R.microplus* Ventral view of female



Fig.No.3.17 *R.appendiculatus* Dorsal view of female



Fig.No.3.18 *R.appendiculatus* Ventral view of female



Fig.No.3.19 *R.zambeziensis* Dorsal view of female



Fig.No.3.20 *R.zambeziensis* Ventral view of female