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Prevalence of ticks and mites infestation in livestock and drug's efficacy against them in district Dera Ismail Khan, KPK., Pakistan

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Abstract
The current study aimed to determine the ticks and mites' Infestation in livestock and drug efficacy against them in Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan. In this study, a total of 957 samples in which 375(39.19%) cows and 582 (60.1%) buffalos were examined. Total 794 species of ticks and mites were observed in which ticks were 582 (73.3%) and 212 (26.7%) were mites, which causes Infestation on cow and buffalo bodies. The overall infection percentage of male Sample was 38.42%, while the females were 41.87%. The drug's efficacy is also noted by applying drugs on animal's bodies. Ticks and mites were present more on the udder part, perineum, the lower abdomen, genital areas, and ears of the animal body. In addition, we identify the species (*Tropilaelaps spp, Haemaphysalis spp, Amblyomma spp, Mesostigmata spp, and Tropilaelaps spp*. It was concluded that the drug trichlorfon 50 ml, when applied on cow and buffalo body surface, has highly effective against ticks and mite's treatment compared to kerosene plus sour oil 100ml.

Keywords: ectoparasites, ticks, mites, cow, and buffalos, Dera Ismail Khan. Pakistan

Introduction
The livestock sector is an important part of the world economy, especially in developing countries. Animal husbandry plays an essential role in agriculture-based economies, especially in developing countries. Pakistan's economy is dominated by the agricultural sector, which accounts for 19.8% of the country's Gross Domestic Product (GDP) and approximately 42.3% of the total workforce. Animal husbandry is an important agriculture sub-sector, accounting for about 58.6% of the agricultural added values. Its share in agriculture exceeds the sum of all other farming sub-sectors and directly accounts for 11.6 of the national GDP [1].

Ectoparasites cause enormous economic losses to the livestock industry due to daily blood-sucking habits, which adversely affect economic production [2]. Most of the approximately 1.49 billion cattle worldwide are easily infected with various ectoparasites [3]. Ectoparasites have been recognized as a serious threat to livestock that induces severe irritation, allergies, and toxicity. It is also known to transmit various protozoan and bacterial diseases between humans and animals [4-7]. Ectoparasite is one of the livestock problems. It is responsible for the massive loss of production mainly due to the direct loss due to anemia and skin damage and the indirect loss due to the transmission of disease-inducing pathogens [8, 9].

The spread of parasites, especially ectoparasites, is a major veterinary problem in most developing and developed countries worldwide. Animal health and production are severely affected by diseases caused by ectoparasites such as mites, flies, lice, fleas, and mantissa. Characteristic symptoms are localized itching, hair loss, and other loss of production [10]. These parasites inhale blood or tissue fluids and are involved in various diseases, including fatigue plasma disease, nanophthalmos, anaplasmosis, many viral diseases, and cause significant economic losses [11]. Neglected or untreated animals have the potential to die [12].

The increase in the incidence of various ectoparasitic infections, including the Infestation of different types of ticks, may be due to several factors, including poorly managed, unbalanced nutrition, and poor sanitary conditions in the animal's breeding area [10]. Ticks are the most economically important pests of small and other livestock species in tropical and subtropical countries [13]. Over 80% of the world's small populations are infected with mites [14]. Harm to animals through blood loss, general stress and irritation, weakened immune system, and

leather damage [15]. Ticks are blood-sucking spider arthropods that need to infect mammals, birds, reptiles, and amphibians [16]. Although ticks are internationally distributed, they occur primarily in tropical and subtropical regions [17]. The optimum temperature and relative humidity required for mite growth and reproduction are 26-37 °C and 85%, respectively [18].

The objectives of this study were to determine the prevalence of ticks and mites on livestock and Finding the efficacy of drugs against ticks and mites.

Materials and Methods

Study site

This survey was conducted in a district named Dera Ismail Khan situated in Khyber Pakhtunkhwa Province, Pakistan. It is the 37th largest city in Pakistan and 5th most prominent in the Province of KPK in terms of population. It lies west of the Indus River, approximately 300 km (190ml) south of capital Peshawar, and about 230 km (140ml) northwest of Multan, Punjab. Its altitude is around 165m (541 ft.). It has a hot desert climate with hot summers and mild winters. Precipitation is mainly concentrated in two distinct periods: late winter and early spring from February to April and during monsoon in June and July.

Study design

The study was based on visiting various forms and local houses of Dera Ismail Khan and other areas inhabited by cattle and buffalo. Animals in the research area were considered to be young animals divided into various categories such as gender (male and female), age-wise (6 months or more), and adult animals (6 months).

Sample size

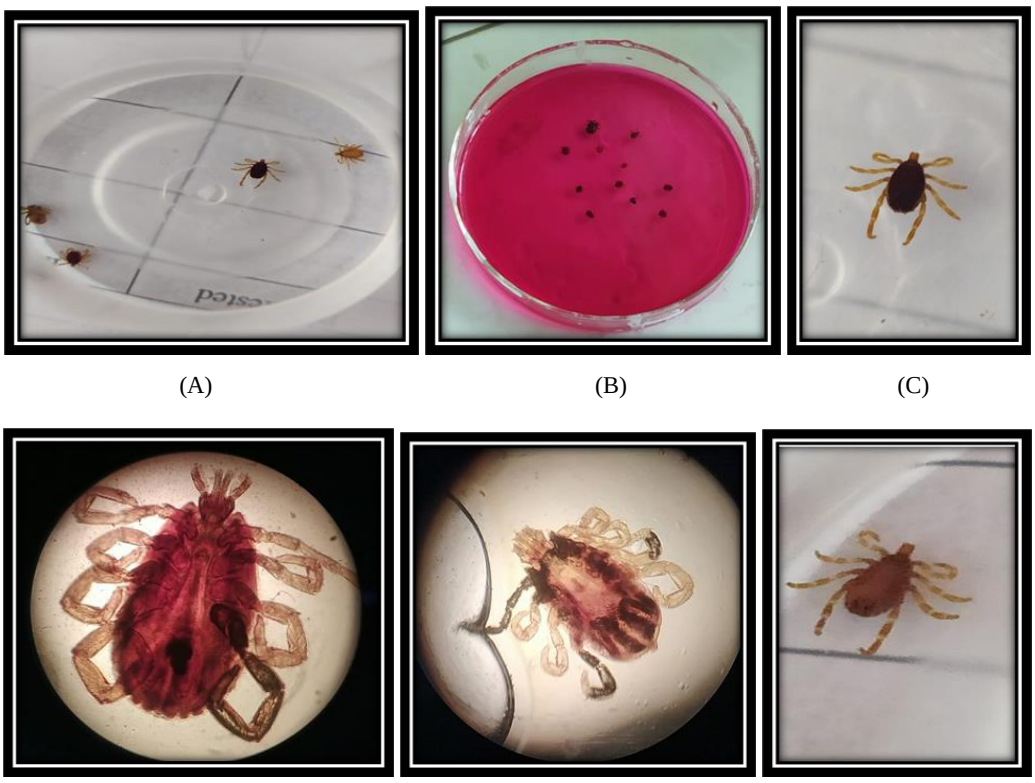
Maximum 957 samples were collected from different regions of Dera Ismail Khan, mainly during the daytime. Each buffalo and cattle were observed based on ticks and mites and then categorized the sample in the form of the infected and non-infected animals. During this survey, buffalos were examined in large numbers compared to cows due to the less presence of cows in the farms and houses of Dera Ismail Khan.

Sample collection

About 957 samples included cows and buffalos, were examined where adults and other developmental stages of ticks and mites were collected from different parts of cows and buffalos like udder, neck, tail, perineum, head, genital areas, causing Infestation through forceps without any damage to their body parts. Then collected ticks and mites were preserved in a labeled disposable bottle containing 70% ethyl alcohol and 30% glycerin so that the body parts of ticks and mites do not damage.

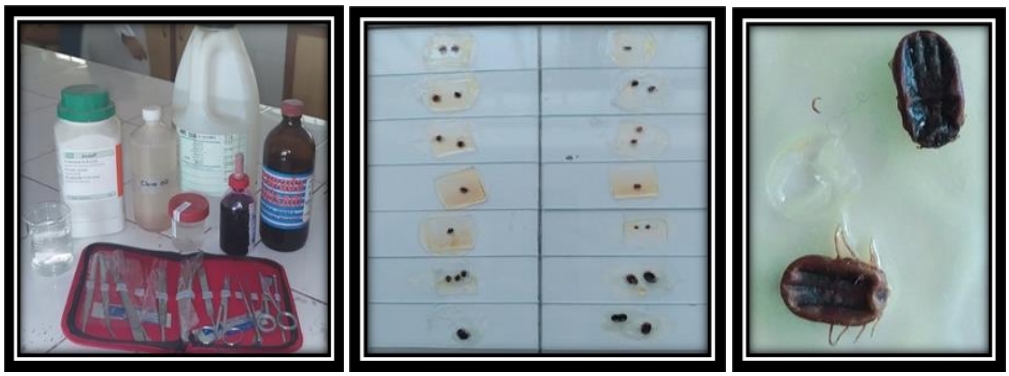
Examination of Sample

The collected sample was then examined in a lab of government girl's college no.2, Dera Ismail Khan, where the sample was taken from ethanol and glycerol solution and kept in a distilled water to remove the preservative solution. Then sample was boiled in 10% potassium hydroxide (KOH) solution for half an hour to remove the chitin layer. The potassium hydroxide solution was done by mixing 20gm KOH with 50ml distilled water. After boiling, the sample was kept in 10% glacial acetic acid (10gm glacial acetic added to 100 ml distilled water) for 5 minutes to remove the potassium hydroxide and then washed with distilled water. After this, the sample was stained in a 10% acid fuchsine (made by myself) for 2 minutes and rinsed with distilled water to remove excess stain. Then the stained specimens were dehydrated by using different percentages of ethyl alcohol, i.e., 30%, 50%, 70%, 80%, 90%, and absolute alcohol. Then the specimen was cleared in clove oil and mounted in Canada balsam on a glass slide, and covered the specimen with a coverslip. And then, the slide was examined under the low and high magnification power of the microscope.



(A) (B) (C)

(D) (E) (F)



(G) (H) (I)

Fig 1: (A) Preserved ticks and mites, (B) Stained ticks and mites, (C) *Ixodes ricinus*, (D) *Amblyomma maculatum* , (E) *Ixodes ricinus*, (F) *Ixodes ricinus*, (G) Material used in research process, (H) ticks and mites slides, (I) hard ticks (*Rhipicephalus microplus)*

Results

Total 957 species of cows and buffalos in which cows were 375 and buffalos were 582 were examined based on their gender, age, and status in different farms and local houses of Dera Ismail Khan. And the total of 794 species of ticks and mites were observed in which ticks were 582 and mites were 212, which causes Infestation on cow and buffalo bodies. The drug's efficacy is also noted by applying drugs on animal's bodies.

Table 1: Showing the Prevalence of tick's infestations gender-wise in Cows and Buffalos.

Sex	Examined	Infected	(%)	Examined	Infected	(%)	Total infected (%)
Male	64	23	35.94	100	40	40	38.42
Female	311	137	15.8	482	195	40.46	41.87

Based on gender, a total of 64 male cows were examined, in which 23 cows were infected due to Infestation through ticks and mites, while a total of 311 female cows were discussed, in which 137 were infected. In buffalos, 100 male buffalos and 482 female buffalos were surveyed, in which 40 male buffalos and 195 female buffalos were infected. The overall infection percentage of male cows and buffalos was 38.42, while the female cows and buffalos were 41.87 (Table 1).

Based on age, a total of 55 cow species and 102 buffalo species of 0-6 months' age were sampled in which infected cows were 32, and infected buffalo were 38, and the total infection ratio was 44.59. Total cow and buffalo species were 85 and 70 respectively of age 6-18 months in which infected cows were 47and infected buffalos were 52, and the total infection ratio was 63.87. The entire species of cows and buffalo were 228 and 417 surveyed having age more than 18 months in which infected cow and buffalos were 81 and 145 respectively, and the infection ratio was 35.04 (Table 2).

In this survey, 794 ectoparasites, namely ticks and mites, were collected from cows and buffalos body surfaces of different farms and local areas of Dera Ismail Khan. Total tick samples were 582, in which 230 ticks infested the cow species, and 352 ticks infested the buffalo's species, and the total infection ratio of ticks and mites was 100. And total mites' species were 212 in numbers, in which 93 mites infected the cows, and 119 mites infected the buffalos, and the infection percentage of both parasites was 100 (Table 3).

Table 2: Showing the Prevalence of ticks and mites infestations age-wise in Cows and Buffalos.

Age group	Total cows sampled	Infected	(%)	Total buffalo sampled	Infected	(%)	Total infected (%)
0-6 months	55	32	58.1818	102	38	37.2549	44.58598726
6-18 months	85	47	55.2941	70	52	74.2857	63.87096774
> 18 months	228	81	35.5263	417	145	34.7722	35.03875969

In this survey, different species of ticks and mites were collected from various sites of Dera Ismail Khan. In Dary-e-Sindh, Kachi Abadi, and Muryali town, a total of 6 other species were surveyed and collected, namely *Ixodes spp, Rhipicephalus spp, Haemaphysalis spp, Amblyomma spp, Mesostigmata spp, Tropilaelaps spp.*

After this survey, I've done the efficacy of the drug against ticks and mites, and for this processive prepared two drugs for efficacy. The one drug was trichlorfon (nawagon) from basharat veterinary store, tijarat ganj, Dera Ismail Khan. The other drug was prepared by myself by mixing kerosene oil and rancid oil of equal amounts. The trichlorfon was first prepared before applying because it was present in powder form, so I added the 20gm of trichlorfon powder into 50 ml of distilled water and then stirred it well to properly form the solution and then applied on cow and buffalo body surface through gloves. Then after 2 hours, washed the cow and buffalo body surface and repeated the same method for 4 to 5 days and after five days noted to result which the infected areas were highly improved through these drugs and also with this, the health and production of milk of cow and buffalo were highly improved.

The 2nd drug was made by myself in which I mixed kerosene oil with rancid oil of equal amount, i.e., 100 ml, and then applied on infected areas of cow and buffalo bodies. After 2 hours, washed those areas and used the same method for five days, and after five days, the results showed that this drug does not show greater efficacy against ticks and mites. So it was concluded that for effectiveness, the trichlorfon was best as a drug to remove ticks and mites from cows and buffalo's bodies.

Table 3: Showing the Prevalence of tick's infestations in Cows and Buffalos

Ectoparasite	Total samples	Infested cows	(%)	Infested buffalo	(%)	Total infected (%)
Ticks	582	230	39.5189	352	60.4811	100
Mites	212	93	43.8679	119	56.1321	100

Table 4: Showing the Prevalence of identified ticks species infestations.

Darya-e-Sindh						
Species identified	***Ixodes spp***	***Rhipicephalus spp***	***Haemaphysalis spp***	***Amblyomma spp***	***Mesostigmata spp***	***Tropilaelaps spp***
Total species	73	58	49	27	23	14
Infested buffalo	40	32	30	14	12	8
Infested cow	32	25	18	12	11	5
Prevalence (%)	98.63013699	98.27586207	97.95918367	96.2962963	100	92.85714286
Kachi Abadi						
Species identified	*Ixodes spp*	*Rhipicephalus spp*	*Haemaphysalis spp*	*Amblyomma spp*	*Mesostigmata spp*	*Tropilaelaps spp*
Total species	69	62	42	34	19	18
Infested buffalo	41	42	21	18	9	7
Infested cow	24	17	14	10	9	6
Prevalence (%)	94.20289855	95.16129032	83.33333333	82.35294118	94.73684211	72.22222222
Muryali town						
Species identified	*Ixodes spp*	*Rhipicephalus spp*	*Haemaphysalis spp*	*Amblyomma spp*	*Mesostigmata spp*	*Tropilaelaps spp*
Total species	61	70	35	41	20	17
Infested buffalo	31	30	16	13	6	7
Infested cow	26	31	15	12	7	5
Prevalence (%)	93.44262295	87.14285714	88.57142857	60.97560976	65	70.58823529

Table 5: Table showing the Presence of ectoparasites on the body of the host.

Body parts of Sample	No. of ticks		No. of mites	
	buffalo	cow	buffalo	cow
Head	14	10	5	4
Neck	16	13	9	7
Ear	43	29	13	10
Lower abdomen	67	44	23	14
Udder	65	52	25	18
Perineum	63	61	21	16
Genital areas	55	50	28	19
Total	323	259	124	88

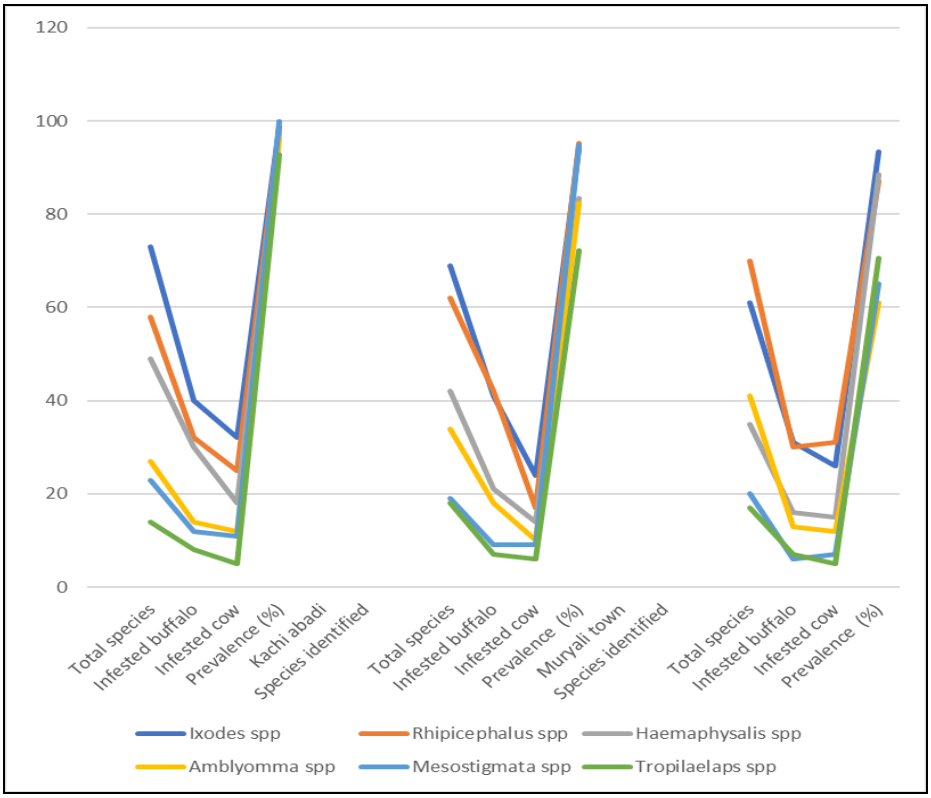


Fig 2: Showing the Prevalence of identified ticks species infestations.

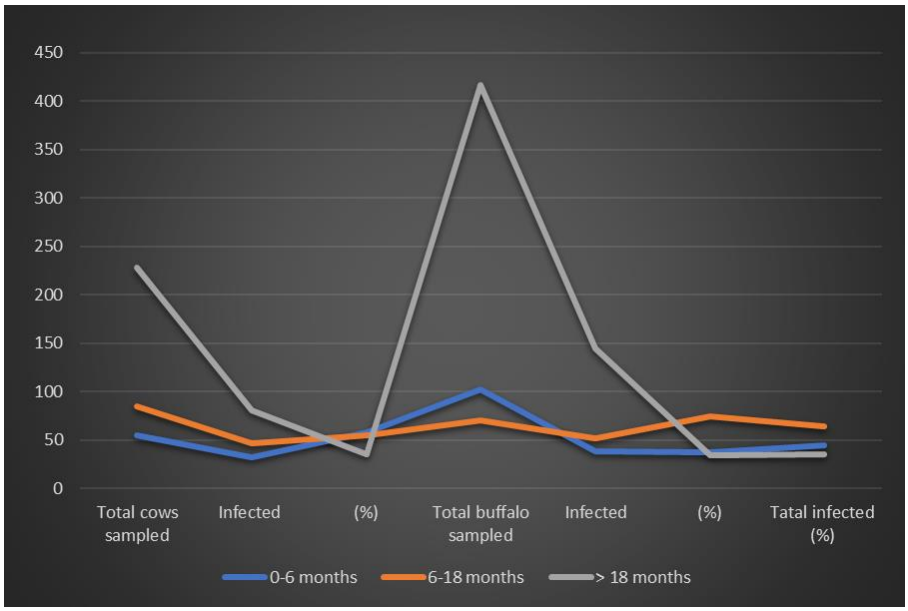


Fig 3: Showing the Prevalence of ticks and mites infestations age-wise in Cows and Buffalos.

Discussion and conclusion

Ticks are a grave chance to dairy and other farm animals breeding society. Tick-borne infection is caused by the unfolding of infectious pathogens that motive fundamental fitness effects in animals and people [19]. R. Microplus is one of the exceptionally common livestock ticks observed on cattle bodies, buffalo, sheep, horses, and dogs [20]. By the finishing of 19th century, ticks and tick-borne infections had generated colossal subjects and substantial command for a new medicine to govern their spread [21]. Alas, recurrent use of these chemical compounds has made them resistant to r. Microplus and different treat ticks. Natural tick and mite repellents had been evolved to decrease the unfavorable results of chemical or artificial /mite repellents, along with resistance, residue, environmental pollution, and damage to different organisms [22].

In step with the record, vegetable oils and herbal remedies can also have extra promising results besides pests as secure substitutes for biodegradable environments [23, 24]. Cotton is primarily grown as a cheap crop for its natural fiber and seed oil. Refined cottonseed oil (CSO) is used for cooking extracted from unconnected cottonseeds [25]. Due to the high productivity of animals, the cottonseed flakes left after oil extraction are often used as livestock feed [26]. Another application of refined CSO is in the production of edible products such as donuts, cookies, chips, ice creams, and so on [27]. Climate change and global warming have a great influence on the distribution of ticks and tick-borne pathogens because each tick species selects a set of ecological conditions and biological communities, determines their spread and describes the risk areas of related pathogens transmission.

In KP Pakistan, most farmers lack simple information about ticks, their pathogenicity, and the type of hosts they infect, which for the most element ends in unsuccessful manipulate of tick infestations; their research shows that Pakistan KP has in no way reported seasonal ticks and mites distribution sample. All through this survey, information on tick load in relative humidity and the temperature was recorded, which is crucial for the timing of capability manipulate measures during the contamination season. The goal observes location skilled high temperature and humidity in march, April, May, June, and July, so a heavy tick infestation was recorded at some point of these months. However, December, January, and February have decreased temperatures, so that some ticks may decrease infection prices.

Recommendation

Clean the places where cows and buffalos live every day to reduce the possibility of ectoparasites. And drugs like trichlorfon (nawagon) should be applied once or twice in a week and should be vaccinated according to their schedule. If ticks and mites are greater in number on cows and buffalo's bodies, they should be removed either through comb or through hands by wearing gloves.

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