Turk. J. Vet. Anim. Sci.
2008; 32(4): 309-313

Short Communication

Seasonal Frequency of Ectoparasite Infestation in Dogs from Shiraz, Southern Iran

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Received: 25.04.2007

Abstract: The objective of this study was to determine the prevalence of canine ectoparasite infestation in pet dogs from the Shiraz area of southern Iran, with no known exposure to insecticides. In all, 160 dogs were examined for ectoparasites in each of the 4 seasons and samples were collected. The most common ectoparasite was *Ctenocephalides canis*, which infested 22 of the 160 dogs. *Pulex irritans* was identified on 2 of the dogs and 142 *Rhipicephalus sanguineus* ticks were found on 13 dogs. *Trichodectes canis* was observed on 2 dogs and 8 dogs had *Hippobosca* flies, which were seen mostly in spring. All superficial skin scrapes for mite detection were negative. A significant correlation was observed between increases in temperature and decreases in humidity, and increased ectoparasite infestation ($r = 0.26$; $P = 0.001$ and $r = 0.23$; $P = 0.004$, respectively). The number of dogs infested with ectoparasites in summer and spring was significantly higher than in winter ($P = 0.007$).

Key Words: Dogs, season, ectoparasite, southern Iran, fleas, ticks, lice

The phylum Arthropoda includes many species of insects (class: Insecta), and mites and ticks (class: Arachnida; order Acarina) that are ectoparasitic to domestic animals. External parasites are major causes of distress and disease in dogs (1). Ectoparasites are a common and important cause of pruritic and non-pruritic skin disorders in dogs and cause hypersensitivity disorders. For example, chewing lice are active ectoparasites that can produce intense irritation with secondary bacterial infection (1,2). In addition, many species of arthropod are responsible for the transmission of disease to other animals or are vectors for some diseases that are transmitted to humans. They also may cause life-threatening anemia in young or debilitated animals (3). The invasion of ixodid ticks increases the risk of canine tick-borne diseases, especially canine ehrlichiosis and babesiosis. *Rhipicephalus sanguineus*, the brown dog tick, is a vector for *Babesia canis*, *Babesia vogeli*, *Ehrlichia canis*, and *Hepatozoon canis* (4). *Pulex irritans* is a vector for *Yersinia pestis*, the causative agent of plague, and for a canine tapeworm, *Dipylidium caninum* (5). Nonetheless, most dogs with ectoparasites have no clinical symptoms. Determining the prevalence of ectoparasites in dogs is of hygienic importance, both for dogs, especially work dogs that are in contact with stray dogs, and their owners.

Despite an increase in the tendency in the Shiraz area of Iran to keep dogs in family homes, and greater importance being paid to family and pet hygiene, adequate information on the frequency of ectoparasite infestation in pet dogs in this populated area and its seasonal fluctuation was not available. Consequently, the present study was performed to determine the prevalence of ectoparasites in dogs from the Shiraz area.

The study was carried out between January and December 2002 in Shiraz, Fars province (Figure 1). Climatological information regarding this location during the course of the study is summarized in the Table.

One hundred and sixty pet dogs from different parts of Shiraz that had not previously received veterinary care

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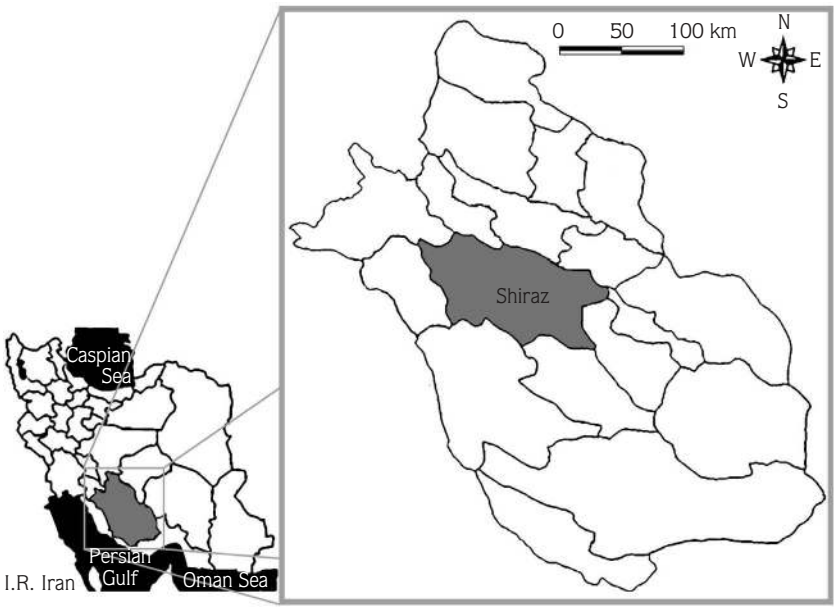

Figure 1. Map of the study area, Shiraz, Fars province, Iran.

and had no known exposure to insecticides were examined. The dogs' ages were determined according to dentition and general appearance. The dogs were restrained and in some cases examination was performed following sedation with xylazine (Bayer, Rampun). The coat of each dog was systematically disturbed with a comb or a forceps. All external parasites were removed and identified.

The animals were examined in detail and as many fleas as possible on infested animals were collected with toy paste. Any fleas captured were fixed and cleared in 10% KOH, and subsequently examined under a light microscope. They were identified using the keys of Soulsby (4).

The skin of all dogs were palpated and meticulously inspected for the presence of ticks, lice, and flies. All ticks were removed carefully to ensure that the mouthparts remained intact. All the collected ticks, lice, and flies were preserved in 70% ethanol. The specimens were identified under a stereomicroscope (100× magnification) by comparing their characteristics to those presented in the taxonomic keys of Soulsby (4).

In the case of skin mites, if mange-like lesions were present, the hairs around the affected area were clipped and scrapings were made with a number 10 scalpel blade. A little mineral oil on the blade was used and scraping was continued until a small amount of blood appeared. Specimens were brought to a boil in 10% KOH to clear the mites and eliminate the host cellular debris.

Data analysis was performed with SPSS v.11.5 for Windows (SPSS Inc, Chicago, IL, USA). Spearman's correlation test was performed to determine the correlation between ectoparasite infestation, and age and season, separately. Fisher's exact test was performed to investigate differences in ectoparasite infestation according to age and season. Statistical significance was considered $P < 0.05$.

Data for the isolated ectoparasites from dogs in Shiraz are presented in the Table. Twenty-two dogs had fleas of which 20 had *Ctenocephalides canis* (Figure 2B) and 2 had *Pulex iritans* (Figure 2A), which were seen mostly in spring and summer. Thirteen dogs had ticks (*Rhipicephalus sanguineus*), which were seen mostly in summer (Figure 2D). A total of 142 ticks were recovered from 13 (29.5%) dogs. Two dogs had lice (*Trichodectes canis*), 8 dogs had *Hippobosca* flies, including *H. rufipes* and *H. equina* (Figure 2C), which were seen mostly in spring, and none of the dogs had mites. Four dogs were infested with more than 1 type of ectoparasite. Ectoparasite infestation was mostly observed in spring and summer (11.3% and 10.6%, respectively), and was minimal in winter (2.5%). An increase in the prevalence of ectoparasite infestation was correlated with increased temperature ($r = 0.26$; $P = 0.001$). Increasing humidity had a significant correlation with a decrease in the prevalence of ectoparasite infestation ($r = 0.23$; $P = 0.004$). The prevalence of

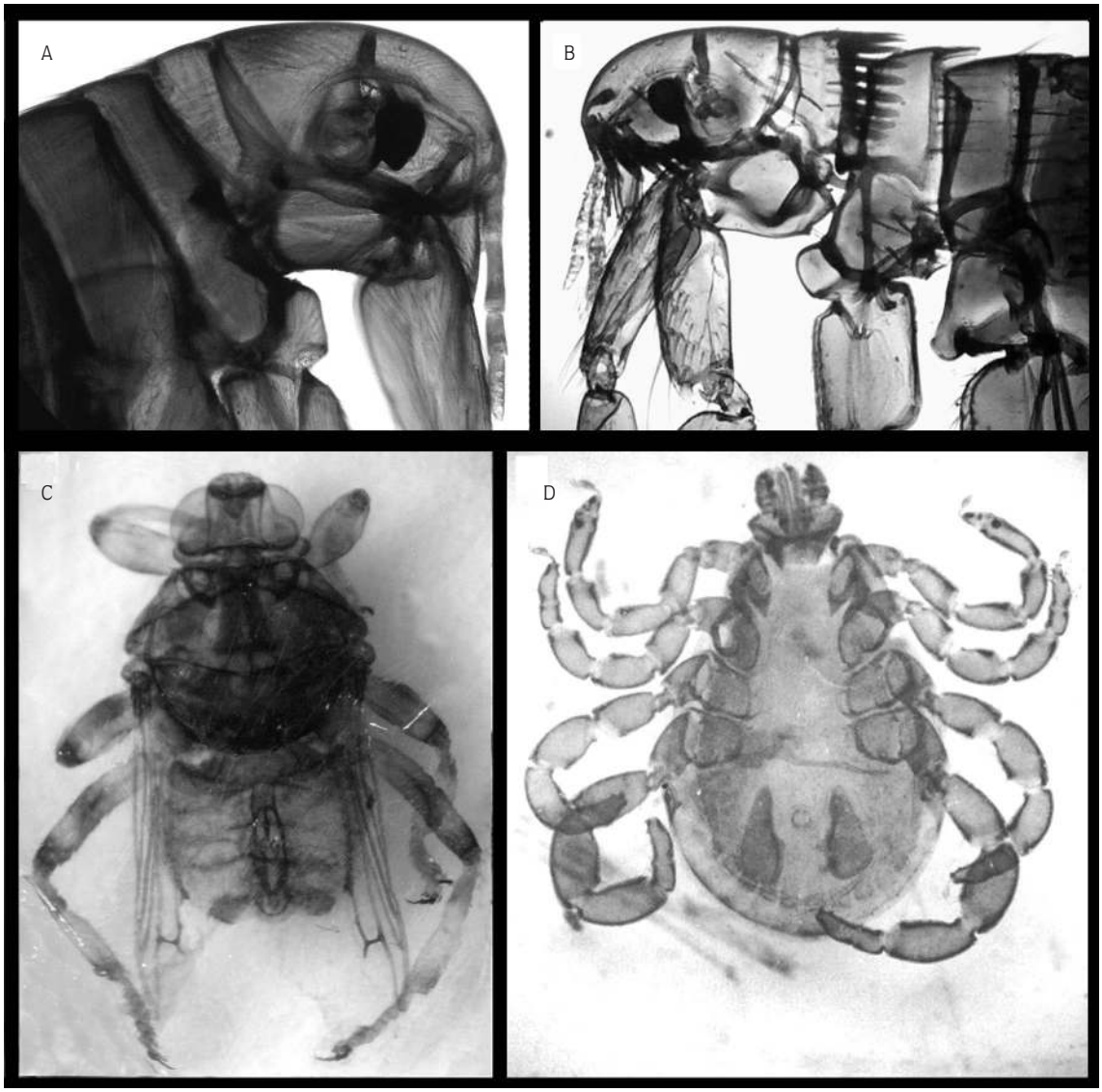

Figure 2. Ectoparasites collected from pet dogs in Shiraz, Fars province, Iran. A: *Pulex iritans*; B: *Ctenocephalides canis*; C: *Hippobosca rufipes*; D: *Rhipicephalus sanguineus*.

ectoparasite infestation was greatest among dogs 1 to 6 months of age (9.4%), whereas the prevalence among the other age groups was not significantly different (P = 0.85). Age and prevalence of infestation were not significantly correlated (r = 0.06; P = 0.48).

The dog flea, *C. canis*, was the most common flea found on the dogs from the Shiraz area, infesting 20 of the 160 (12.5%) dogs, and no *C. felis* were found. These results are not consistent with previous studies that stated *C. felis* was the most common flea (6,7); however, Fukase et al. (8) reported that *C. canis* was more common (observed on 74 of 180 dogs) than *C. felis* (observed on 23 of 180 dogs) in Kanagawa, Japan. Similar to our study results, Le Riche et al. (9) and Chukwu (10) reported that *C. canis* was the most common flea in Kabul, Afghanistan, and Anambra, Nigeria, respectively, and that no *C. felis* were observed. According to Anvar et al. (11), *C. canis* and *C. felis* have been reported on various host species from different parts of Iran, but their prevalence was not noted.

An earlier study in north central Florida found that 20% of dogs were infested with *Pulex* spp. and only 1 dog was found to have *E. gallinacea* (6). A recent study in

Tampa, Florida, that assessed the efficacy of an insect growth regulator and an insecticide on 35 dogs and cats found that all the animals were infested only with *C. felis* (12); however, in the present study *Pulex iritans* was identified on 2 of the 160 (1.25%) dogs.

Environmental conditions can affect the survival and multiplication of ectoparasites. For example, the development of flea larvae occurs in protected microhabitats with moderate temperatures and high relative humidity (13). In the present study we noted a significant difference in the mean number of dogs infested with ectoparasites in different seasons (P = 0.007). Mean (± SD) temperature differences were noted during the collection period (Table). Lower autumn/winter temperatures, when compared to spring/summer, may have contributed to the reduced level of ectoparasite infestation observed in autumn/winter.

Only 8.1% of the dogs examined were infested with *Rhipicephalus sanguineus*. To the best of our knowledge there are no studies of the prevalence of ticks on dogs in Iran. One previous study (9) reported that 31 of 105 dogs were infested with 5 species of ticks in Afghanistan and that *R. turnanicus* and *R. sanguineus* were the most common. *Rhipicephalus turnanicus* was not observed on any of the dogs in the present study. Linardi and Nagem (14) reported that *R. sanguineus* was the most common tick observed on dogs in Belo Horizonte, Brazil. Zygner and Wedrychowicz (15) stated that ticks feeding on dogs had 2 extremes in seasonal activity in Warsaw, Poland: highest activity was in May and lowest activity was in September. Morales-Soto and Cruz-Vázquez (16) reported a higher prevalence of *R. sanguineus* in April and a lower prevalence in February and December on dogs in the Morelos area of Mexico. There was a significant difference (P = 0.01) in the prevalence of *R. sanguineus* according to season. The prevalence on dogs in summer and spring were significantly higher than in winter. In addition to flea and tick infestation, lice infestation of dogs has been reported worldwide. For dogs, 2 species of louse have been reported (17): an anoplura species, the sucking louse (*Linognathus setosus* Olfers 1816), and a mallophaga species, the chewing or biting louse (*Trichodectes canis* de Geer 1778). Lice are reportedly the most common ectoparasites on dogs of the northern hemisphere (18). *Trichodectes canis* was found on 2 of 44 dogs infested with ectoparasites in the present study (4.5%). It is a minor ectoparasite of the dog population of the Shiraz area. In a Swedish study, among 117 dogs that had lice, 96% had *Linognathus setosus* and 3% had *Trichodectes canis* (18).

Hippobosca flies were found on 8 of 44 dogs infested with ectoparasites in the present study (18.2%) and in the study by Le Riche et al. (9) from Kabul, Afghanistan, 25 of 105 dogs had *Hippobosca capensis*.

Table. Ectoparasites isolated according to season and age group.

Seasons	Air temperature[†] (°C)	Relative humidity (%)[†]	Infested dogs[‡]					
			Dogs	Tick (%)	Flea (%)	Louse (%)	Fly (%)	Total (%)
Winter	9.8 ± 3.8	46.3 ± 5.8	37		3 (8.1)	1 (2.7)		4 (10.8)[b]
Spring	25.16 ± 4.5	22.6 ± 3.0	42	4 (9.5)	7 (16.7)	1 (2.4)	6 (14.3)	13 (30.9)[a]
Summer	29.2 ± 2.6	24.0 ± 2.0	43	8 (18.6)	8 (18.6)		1 (2.3)	17 (39.5)[a]
Autumn	14.9 ± 5.7	46.0 ± 2.1	38	1 (2.6)	4 (10.5)		1 (2.6)	6 (15.8)[b]
Age groups								
1-6 months	50	4 (8)	7 (14)	2 (4)	4 (8)	15 (30)		
6-12 months	36	3 (8.3)	4 (11.1)		2 (5.6)	8 (22.2)		
1-3 years	40	3 (7.5)	6 (15)		1 (2.5)	9 (22.5)		
3-6 years	34	3 (8.8)	5 (14.7)		1 (2.9)	8 (23.5)		
Total	160							

[‡]Four dogs were infested with more than 1 type of ectoparasite. All superficial skin scrapings for mite detection were negative.

[†]Mean (± SD) climatological data for the experimental year (January-December 2002) from the Shiraz Meteorological Center.

[a,b]Significant differences between the same superscript letters in the same column (P < 0.05).

Various mites can infect the skin of dogs; however, superficial skin scrapings did not reveal the presence of mites in our dog population.

To the best of our knowledge this is the first study conducted in Iran that examined the prevalence of ectoparasites in a dog population. The results showed that fleas and ticks were the most common ectoparasites in dogs from the Shiraz area in the spring and summer; however, this survey was limited to the Shiraz area and additional studies are required to complement these findings and help veterinarians prepare a complete program for the control of these parasite populations and their associated diseases.

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