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RESEARCH PAPER

A survey on the prevalence of some ectoparasite species infesting sheep and goats in Kalar district, Kurdistan region, Iraq

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A B S T R A C T:

Tamed small ruminants such as sheep and goats are deemed important sources of people livelihood in Garmian area including Kalar district. Sustainability and prosperity of livestock resources are vigorously influenced by the heavy infestation of small ruminants with ectoparasites owing to the enormous economic loss caused by them, particularly in under-developed countries including Iraq. Hence, the present survey, carried out from March, 2019 to February, 2020 in Kalar district, intended to investigate the rampancy of external parasites among sheep and goats being reared in the aforementioned district. To meet the requirements of the survey, a total of 1700 sheep and 400 goats were arbitrarily sampled. The overall rate of ectoparasitosis in this study was 53.09%, in that, the infestation rate in goats (95%) was significantly higher than that of sheep (43.23%). Regarding sheep pediculosis, two species of lice; *Linognathus (L.) africanus* (35.58%), *Damalinia (D.) ovis* (24.11%), and two species of ticks; *Hyalomma (H.) anatolicum* (2.94%), *Rhipicephalus (R.) turanucus* (4.41%), in addition to the nasal bot fly, *Oestrus ovis* (12%) were identified. On the other hand, two species of lice; *D. caprae* (80%), *L. africanus* (30%), and two species of ticks; *H. anatolicum* (7.5%) and *R. turanucus* (3.75%) were detected in goats. Co-infections were significantly higher in sheep as compared to goats in this survey. Some of the aforementioned external parasites are known to transmit zoonotic diseases since sheep and goats are reared in close cohabitation with humans. For that reason, sustainable control of ectoparasitosis especially, tick infestations in domestic livestock is compulsory to prevent both economic loss and transmission of some serious diseases.

KEY WORDS: Ectoparasites, Sheep, Goats, Kalar, Prevalence
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1.INTRODUCTION :

Over 80% of classified animal species belong to arthropods. These joint-legged invertebrates are found in all habitats on earth and include varieties of classes such as insects, arachnids, myriapods, and crustaceans. Mode of living of some arthropods is parasitic on vertebral hosts feeding either on skin or blood. Ectoparasitosis has direct or indirect effects on the susceptible hosts (Seid et al., 2018). The chewing lice, *Damalinia (D.) ovis* and *D. caprae* are small (1.5-3 mm) yellowish brown ectoparasites feed on the cutaneous cells, lipids, sweat secretion and

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skin bacteria of their vulnerable hosts (Oormazdi and Baker, 1979). Epidemiologically, chewing lice, also called biting lice, infest sheep and goats worldwide. The infectivity of these wingless insects has been studied in some districts of the Kurdistan region and some parts of Iraq (Zangana et al., 2013; Pols and Mawlood, 2015; Mustafa, 2019). Moreover, domesticated small ruminants are also prone to infestation with sucking lice of the genus, *Linognathus*. For example, the obligate haematophagous blue louse, *Linognathus (L.) africanus* is capable of infesting both goats and sheep parasitizing on different parts of the body particularly the neck, back and the nape (Rashmi and Saxena, 2017). Usually, lice induce pruritic behavior in the host, and in response to that, the hosts rub, scratch, and bite their skins, which indirectly reduce the quality of the wool and hair (James and Moon, 1998).

Hard ticks (family: Ixodidae) are obligatory blood feeding ectoparasites comprise around 900 known species. Besides their blood feeding and skin damage, these acarines transmit many viral, bacterial and parasitic diseases, and they are reckoned second to mosquitoes in the transmission of infectious diseases (Parola and Raoult, 2001). Ovine and caprine similar to any other vertebrate hosts are exposed to infestation with hard ticks. Various ixodiod ticks of sheep and goats were identified and reviewed in Iraq, including the Kurdistan region (Hussien and Yaqub, 2010; Mohammad and Jassim, 2011; Kadir *et al*., 2012; Mohammad, 2016). In this regard, Zangana *et al.* (2013) have documented five species of ixodiod ticks in ovine and caprine, viz. *Rhipicephalus (R.) sanguineous, R. turanicus, Hyalomma (H.) anatolicum anatolicum, H. marginatum,* and *Haemaphysalis spp*.

Larvae of the Dipteran bot fly, *Oestrus (O.) ovis* are cosmopolitan parasites which infest the nasal passages of sheep and goats. The viviparous females of *O. ovis* deposit first-stage larvae directly in the nasal orifices as a part of their life cycle. When the larva develops in the nasal sinus, it can cause a clinical picture termed, ovine oestrosis which characterized by difficulties in breathing, nasal discharge, myiasis of the nasal passages and frontal sinuses, frequent sneezing and dyspnea (Dorchies et al., 1998). In addition to its effects on animals, this parasite is considered zoonotic and can infect human respiratory system and eye causing ophthalmomyiasis (Abdellatif et al., 2011).

Sheep and goat farming is one of the most important livestock husbandry activities in the Kurdistan region, including Kalar district. These domesticated animals significantly contribute to the provision of meat, milk, hide and skin, hair, horns, bones, manure and other materials that directly affect the economic growth of the area. Due to the significant impacts of ectoparasites on their hosts, the present study aimed to investigate the availability and intensity of sheep and goat ectoparasitosis in Kalar District and the surrounding villages.

2. MATERIALS AND METHODS

2.1. Study site

Kalar district is located in the southeast of Sulaymaniyah Province, the Kurdistan Region of Iraq. The weather of the area is hot and dry in the summer, and the temperature reaches over 50°C in July and August. The coldest months of the winter are December and January in which the temperature seldom reaches 0°C. Geographically, the district is located in between the latitude (34.6308° N) and the longitude (45.3276° E) of the eastern hemisphere. Kalar has a large area estimated of 438,317 km^2 with almost 250,000 populations. According to the annual report (issued in 2019) of the directorate of veterinary and animal resources in Kalar, there are nearly 100 flocks of sheep and 60 flocks of goats estimated with 45,000 sheep and 6,500 goats.

2.2. Collection of specimens

In the present study, 1700 sheep and 400 goats were examined randomly for the prevalence of ectoparasites between March 2019 and February 2020. The age of the animals was from six months to five years. The animals were selected randomly from 10 flocks of sheep and 6 flocks of goats from 10 locations in and around Kalar district (Fig 1). The samples were collected from different parts of the animal body (head, neck, flanks, front and rear legs, and abdomen). Regarding ticks, all the samples were collected from the body of the animals (fed ticks), tweezers were used carefully to remove the ticks. Lice were collected using brushing with fine comb (Yakhchali and Hosseine, 2006). Larvae of *O. ovis* were collected from the nasal cavity of

slaughtered sheep. Fifty heads of recently slaughtered sheep were purchased from local butchers. The heads were sawn at the sagittal plane (Figure 2) and washed out with normal saline (Hidalgo *et al*., 2015).

Figure 1: Map of the study area where samples of ectoparasites collected (1: Saida, 2: Shakal, 3: Punga, 4: Qarachil, 5: Qasm Agha, 6: Saykhalyl, 7: Barlut village, 8: Shorawa, 9: Rizgari, 10: Girda Gozina

Figure 2: Dissection of a sheep head at the sagittal plane showing larvae of *Oestrus ovis* in the nasal cavity

2.3. Laboratory examination of ectoparasites

After collection, samples were preserved in 70% ethanol and transferred to the laboratories of the College of Agricultural Engineering Sciences, University of Salahaddin. Samples were examined using a stereo microscope and images were taken using a digital Canon camera (Ucmas series microscope camera). All samples were identified according to Kim and Ludwig (1978); Walker *et al*. (2003).

2.4. Statistical analysis

Chi-square test was applied in the present study for analyzing differences in infestation rates using PRISM software version 6.1. Differences between variables were considered significant when the P value was less than 0.05.

3. RESULTS

The overall prevalence of ectoparasites in both sheep and goats was 53.09 %. Out of 1700 sheep investigated for ectoparasites, 735 were infested with at least one species of parasite. Whereas, out of the 400 inspected goats, 380 were infested. The prevalence of ectoparasites in sheep and goats in Kalar district is shown in table 1. The infestation rate in goats (95%) was significantly higher than those in sheep (43.23%) ($P< 0.05$).

Table 1
Prevalence of ectoparasites on sheep and goats in Kalar district

Host type	No. of samples	No. infested	Infestation rate %
Sheep	1700	735	43.23
Goats	400	380	95
Total	2100	1115	53.09
	Chi-square= 348.4	df=1	P=0.0001

In the present study, 6 different genera and species of parasites were identified in both sheep and goats. Regarding sheep, the sucking lice, *L. africanus* was the most dominant ectoparasites found in this study (35.58%). The chewing lice, *D. ovis* came next (24.11%). Two species of hard ticks were also identified in sheep; *R. turanicus* and *H. anatolicum* with infestation rates of 4.41% and 2.94% respectively. Larvae of *O. ovis* in the nasal cavities of sheep were found to be 12% (Table 2).

The most common ectoparasites identified in goats in this study was the chewing lice, *B. caprae* (80%) followed by the sucking lice, *L. africanus* (30%) and the two hard ticks *H. anatolicum* and *R. turanicus* with infestation rates of 7.5% and 3.75% respectively. There were significant differences between infestation with different species of parasites in both sheep and goats (Table 2).

Table 2

Prevalence of different genera and species of ectoparasites in sheep and goats in Kalar district

Host type	Number of samples examined	Ectoparasites	Infestation rate %
Sheep	1700	*Linognathis africanus*	35.58 (605/1700)
		Damalinia ovis	24.11 (410/1700)
		Hyalomma anatolicum	2.94 (50/1700)
		Rhipicephalus turanicus	4.41 (75/1700)
		Oestrus ovis	12 (6/50)
Goats	400	*Damalinia caprae*	80 (320/400)
		Linognathis africanus	30 (120/400)
		Hyalomma anatolicum	7.5 (30/400)
		Rhipicephalus turanicus	3.75 (15/400)

Most sheep were infested with more than one ectoparasite (co-infestation) at the same time (63.26%) as compared to the infestation with single parasite (36.73%). However, goats showed different results, in which the rate of infestation with single parasite (71.05%) was higher than those with multiple infestations (28.94%). Statistical analysis showed a significant difference in multiple and single infestation between sheep and goats ($P<0.05$), as shown in table 3.

Table 3
Single and multiple infestations with ectoparasites in sheep and goats in Kalar district

Host type	Samples examined	Single infestation rate %	Multiple infestation rate %
Sheep	1700	36.73 (270/735)	63.26 (465/735)
Goats	400	71.05 (270/380)	28.94 (110/380)
	Chi-square= 118.1	df=1	P=0.0001

Figure 3: Ectoparasites of sheep and goats detected in Kalar area: A- *Damalinia caprae*, B- *Damalinia ovis*, C- *Linognathus africanus*, D- *Rhipicephalus turanicus*, E- *Hyalomma anatolicum*, F- A larva of *Oestrus ovis*

4. DISCUSSION

The present survey was designed to investigate the diversity of ecotoparasites of small ruminants in Kalar district. Based on previous published papers, this survey could be the first attempt to document and validate ectoparasites in Kalar area where livestock are being raised intensively. Parasites pose a great menace on the livestock productivity, which, in turn, causes an enormous economic loss. In this study, the overall prevalence of ectoparasites in sheep and goats collectively was 53.09%. Parasite infestation in goats (95%) was significantly higher as compared to that of sheep (43.23%). The same conclusion was reported by Zangana *et al*. (2013) in Duhok Province when they found higher infestation rate in goats as compared to sheep. In contrast, the study of Mustafa (2019) in Sulaymaniyah province, which is close to Kalar district, recorded a higher rate of ectoparasite infestations in sheep as compared to goats. The reason behind the diversity of ectoparasite rampancy could be the difference in climatic conditions in different areas which might encourage the abundance of certain parasites over others (Yakhchali and Hosseine, 2006). Probably, another reason is related to the seriousness of the

farmers in treating their infested animals with anitiparasitics. For example, sheep rearing is more common than goats in the district, so, according to the veterinary file in Kalar, the majority of livestock raisers are seeking treatment for their sheep. This habit leaves the infested goats untreated or intermittently treated, hence, the rate of ectoparasitosis in caprine will be elevated.

In sheep, the blue lice, *L. africanus* showed the highest parasitic rate 35.58% (605/1700), whereas 30% (120/400) of goats were infested with that parasite. The opposite was observed regarding the infestation with chewing lice, *Damalinia sp.* Eighty percent of the investigated goats were infested with *D. caprae,* however, 24.11% of the sheep were infested with *D. ovis.* Other studies in Iraq have also reported pediculosis in sheep and goats. Al-Saffar and Mohammad (2008) reported that sheep in the city of Mosul were infested with 5 species of lice among them *D. ovis* (6.4%) and *L. africanus* (0.2%). Zangana *et al*. (2013) reported that sheep were infested with *D. ovis* 75% and *L. stenopsis* 33.3% whereas goats were infested with 80.7% and 19.25% with the aforementioned parasites respectively. Mustafa (2019) reported two species of lice in sheep, namely, *D. ovis* 17.74% and *L. stenopsis* 13.63%, and two species in goats, vs. *D. caprae* 10.97% and *L. stenopsis* 6.22%. In a morphological study of goats' ectoparasites in Erbil province/Iraq, Pols and Mawlood (2015) have reported and described *D. caprae* and *L. africanus* from goats without mentioning the prevalence rate.

In the present study, two species of ticks were identified which were *H. anatolicum* and *R. turanicus* with prevalence rates of 2.94%, 4.41% and 7.5%, 3.75% in sheep and goats respectively. Mohammed (2016) reported 8 species of ticks from the middle and south of Iraq and the rate of sheep infestation with *H. anatolicum* was (28%) and with *R. turanicus* was (39%). In the same study, goats were also infested with *H. anatolicum* (24%) and *R. turanicus* (64%). The prevalence rate of ticks in this study was lower than what reported by Mustafa (2019) when he found that the infestation rate with *H. anatolicum* was 11.9% and 31.3% and *R. turanicus* was 7.5% and 15.96% in sheep and goats respectively.

Prevalence of *O. ovis* larvae in the present study was 12 (6/50). This was lower than most of the studies carried out in Iraq: 17.2% in Ninevah governorate (Jarjees *et al.,* 2000), 33.4% in Baghdad (Al-Amery, 2007) and 68% in Erbil (Saad *et al*., 1993).

Flactuations in the prevalence rate of this parasite comparing to other studies could be attributed to several factors such as changes in climatic conditions which affect the activity of the adult fly in addition to the animal breeds (Saad *et al*., 1993; Jacquiet and Dorchies, 2002; Al-Ubeidi *et al*., 2017)

5. CONCLUSIONS

Different species of ectoparasites were documented in this survey. The study of external parasites is not just important for animals themselves but rather more important for humans. Haematophagous ectoprasites particularly, ticks are known to transmit serious diseases to animals and humans.

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6. Conflict of Interest

On behalf of the other co-authors in this article, I undertake that there is no conflict of interest among us.

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