

Effect of Tick and Lice on Some Blood Constitute and Trace elements of Local Black Goat in Sulaimani, Kurdistan Region of Iraq

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Abstract: *In this study isolated 100 adult female of local black goat (*Capra hircus*) examined in spring and fall season for Tick and Lice investigations, then divided into two groups: 50 infested goats with ectoparasite and 50 non-infested goats. Three species of ticks (*Rhipicephalus sanguinus*, *R. turanicus* and *R. bursa*) and one species of lice (*Bovicola caprae*) were observed. Biochemical values (serum proteins and some trace elements) analyzed, in infested goats emerges decline in serum protein value 7.12 ± 0.08 $\mu\text{g/dl}$, albumin value 4.12 ± 0.03 $\mu\text{g/dl}$ and increase of globulin value 3.04 ± 0.09 $\mu\text{g/dl}$, in serum protein and globulin values shows not significance differences, while described highly significance differences in albumin value at $p \leq 0.01$, when compare to control goats. In trace elements decline of zinc level 48.97 ± 1.20 $\mu\text{g/dl}$ and copper level 114.15 ± 3.75 $\mu\text{g/dl}$ levels with a highly significant differences at $p \leq 0.01$ in infested goats when compare to control goats. It is observed that mixed infestation has much effects than tick or lice infestation on goats, which led to reduction in serum protein value 6.89 ± 0.20 $\mu\text{g/dl}$, albumin value 4.11 ± 0.09 $\mu\text{g/dl}$ and raise in globulin value 3.10 ± 0.11 $\mu\text{g/dl}$ without any significance differences, also noticed insignificant declines in zinc level 45.67 ± 2.40 $\mu\text{g/dl}$, while decrease in copper level 99.33 ± 9.86 $\mu\text{g/dl}$ significantly at $p \leq 0.05$.*

Keywords: Goat, Tick, Lice, Blood constitute.

1. INTRODUCTION

Ectoparasites are most critical disorders and diseases, which encounter to animals; they led to lose in their productions and disturb animal health entirely. It may be accompanied by more disorders, deficiencies such as decrease in some blood biochemical parameters, blood trace elements and mineral levels, which are seems as a severe health problem in livestock [1]. Hypersensitivity, marked blood loss, secondary infestation, excoriation and ultimately death in few cases, whole of them related to ectoparasitisms, also indirect harm, rubbing and reducing time spent for grazing or rumination as increasing levels of behavior, self wounding in some cases, also referred to the influences of ectoparasites [2]. Tick and lice are involve of about 70% of ectoparasites

that naturally infested goat According to [3]. An economical and short-day breeder of goat make of them an appropriate small ruminant to rearing, which are adaptable in the various ecological situations as like as pathological resistance [4]. Main challenges which exposed with Kurdistan region's livestock health and productivity, are ticks and tick-borne blood parasites disease [5]. Widely ectoparasites especially tick and lice, causes more lesion and disorders for livestock as blood loss, which is led to growth retards and loss of weight (ticks and sucking lice), irritation and discomfort in animal which is called tick worry also in lice, wound which is way of endoparasites and germs of entering to animal's body. Crusting, dermatitis and wool or skin debilitation, especially in chewing lice [6, 7]. One of the most vital parameters are blood biochemical constitutes which that through knowing of them can detect any disorder and infections in human and animals [8], common and important biochemical component is a serum protein and its differentials (albumin and globulin) which they are contribute in immunity, catalytic, regulation system and any imbalance or dysfunction of serum protein component led to emerges disease [9]. Trace elements are essential for maintain, healthy and productivity of each animals, some of the well known established (Fe, Cu, Zn, Co, Se among others) is fundamentally present in most biochemical operation, in animal living body and during any infection, serum trace element alters in their concentration [10]. Our objectives are to carrying out this study, to detect influences of these ectoparasites and also effects of the type of each ectoparasites on serum proteins and some trace elements (Zinc and Copper) of goat, with identifying the genera and species of these ectoparasites that presence in present study.

2. METHODS AND MATERIALS

2.1 Study Area: This study was conducted in Sulaimani Governorate, Kurdistan region. The samples were collected on the local black goats, during spring (April and May) and early fall (September) of 2018.

2.2 Sampling: In this study, adult local black doe (*Capra hircus*) were examined for tick and lice, after investigation, infested goats (n=50) were isolated from non-infested goat (control, n=50), whereas infested goat divided into three groups depend on types of the ectoparasite, as follows:

- 1- Tick infestation
- 2- Lice infestation
- 3- Mixed infestation (Tick and lice)

2.3 Collection of Ticks and Lice: tick and lice or mixed of them were collected from the suspected parts of the goats such as ears, teats, outers reproduction parts, breast, abdomen, mouth and under tails. In the process of tick collection, a fine and smooth forceps was used to remove the ticks with consideration to remain all parts of body healthy and not defected by mechanical pressure. In the lice collection, the procedure was done through brushing the hair of goat, and then lice were placed on a white paper or other like this. Finally tick and lice were collected and placed in the glass vials of 25 mm diameter and 75 mm long that contain 70% alcohol till examination.

2.4 Specimens' examination: The specimens were examined by using Motic digital microscopy 4X magnification., Motic educator, Japan, for studying the minute parts of the body, such as mouth parts, ornamentation, legs, body shape and to comparisons between species or in genus of arthropods according to [11].

2.5 Blood collection and examination: Blood was drawn from jugular vein with 10 ml sterile syringe and 18 gauge needles (Hoshin medical instrument Co., Ltd, P.R.C). Blood are placed in the free anticoagulant tube and left to clot and then centrifuged at 3000 rpm for 15 min (Hettich, zentrifugen, D-78532 Tuttlingen, Germany), and collected serum kept frozen at -20°C until examined it [12].

2.6 Blood smear and fecal examination: Geimsa stained blood smear and fecal direct smear examined through Motic digital microscopy, 40X, 60X and 100X, Motic educator, Japan., were carried out, to ensuring lack of any endoparasites in blood and feces, to avoid any interaction with ectoparasites effect in infested goat and to distinguish control goats with its each declines in their blood values.

2.7 Serum protein examination: Serum protein, albumin and globulin were determined by automatic BioLis 24i premium analyzer (Tokyo BOEKI MEDISYS INC. ©Diamond diagnostic®). Determination in this apparatus, operation was carried out by Beer Lambert laws, globulin portion of serum protein was determined through the deduction of albumin portion from total serum protein: $Serum\ protein - Albumin = Globulin$

2.8 Zinc and copper determination: Zinc and copper were determined manually by Spectrophotometer (PD-303, APEL., co., Ltd. Japan). Specific commercial kits were used in both determinations. For zinc was used commercial kit (Colorimetric test with 5-Brom-PAPS, Egypt biotechnology co.), MDSS GmbH. Schiffgraben 41, 30175 Hannover, Germany, and its procedure run on, by preparing at first blank as (1ml of reagent and empty of standard and sample), standard as (1 ml of reagent, 50 µl of standard and empty of sample) and sample as (1ml of reagent, 50 µl of sample and empty of standard), and

using 560 nanometer wave length with turn apparatus on an absorbance reading, their records for blank is 0.076 and for standard is 0.295. Also for copper was used commercial kit (Egypt biotechnology co.), MDSS GmbH. Schiffgraben 41, 30175 Hannover, Germany, and its procedure ran on by preparing at first blank as (1ml of reagent and empty of standard and sample), standard as (1 ml of reagent, 66 µl of standard and empty of sample) and sample as (1 ml of reagent, 66 µl of sample and empty of standard), and using 580 nanometer wave length with turn apparatus on an absorbance reading, their records for blank is 0.081 and for standard is 0.243.

2.9 Data Analysis: Data after rearrangement and designed in the table, were analyzed through T. test independent sample and one way ANOVA uni-factor CRD and using both ($p \leq 0.01$) and ($p \leq 0.05$), analysis process carried out by SPSS program, release of 16.0.0 (sep. 13, 2007).

3. RESULTS AND DISCUSSION

As by examination in local goat, founds that there were two types of ectoparasite, which are hard ticks (Ixodidae) family and chewing lice (Mallophaga), through detection of important parts such as mouth parts and legs and presence of ornamentation in hard ticks, also head and body part and shapes in lice, were founds that, in hard ticks, that three species which are *Rhipiciphalus sanguinus*, *Rhipicephalus turanicus* and *Rhipicephalus bursa*, in lice one species of chewing type observed, which was *Bovicola caprae* as illustrated in the Table 1.

Table 1: Prevalence of ectoparasites on goat in Sulaimani.

Ectoparasites	Tick			Lice
	<i>R. turanicus</i>	<i>R. sanguinus</i>	<i>R. bursa</i>	<i>B. Caprae</i>
Species				
Number	68	77	16	210
Total		161		210
Percentage%	42.23	47.82	9.95	100

In the ticks as founds there were three species of *Rhipicephalus*: *R. sanguine* (47.82%), which is known a brown dog tick, also infested small ruminants especially animals that reared close to dog [13], *R. turanicus* (42.23%) and *R. bursa* (9.95%) which is known as brown ear tick. *Rhipicephalus spp* refers to important genus of hard ticks, which are indicated through having short mouth parts, eyes and presence of festoons with hexagonal basis of capitulum, and absence of ornamentation on their backs as identified by [14]. These three species were mostly similar in their future, especially they have a dark scutum, U shaped genital aperture in female and short pedi palpus except of some differences as in fed male of *R. bursa* caudal appendage is absent or small while in *R. sanguinus* and *R. turanicus* are abroad and visible, genital aperture in female of *R. turanicus* is narrow but in *R. sanguinus* is abroad according to [11, 14]. In spring months as April and May *R. sanguinus* and *R. turanicus* were high prevalence while in Fall tick was absent generally as shows in our results, so its concur with results of the study which was observed that, *Rhipicephalus spp* is

most frequently appear in the spring months in Sulaimani [15] as their environment are favorable for growth, activity, reproduction and development of ticks [16], also our results is agreed with [17] in Sulaimani-Kurdistan region in the infestation with *R. sanguinus* and [18] in Ilam province in Iran which they found that *R. sanguinus* is most prevalence tick on goat but in the distribution of percentage of *R. bursa* is contrast with results of this study as they said that this species distribution is 41.5% on goat and in another study also contrast with present study as they said that 89% of goat in Urmia, Iran are infested with *R. bursa* [19], also the present study is agreed with the observation of [3] in Duhok-Kurdistan region, which founds that *R. turanicus* and *R. sanguinus* are most prevalence species on goat by 45.54% and 33.93% respectively. Present study is agreed with another examination by some researcher which mentioned in their works that *Rhipicephalus* spp is appeared after rainy seasons, as spring season and also agree with their states of some researchers which mentioned that they are not founds any other genera especially *Hyalomma* spp. and *Haemaphysalis* spp in their works [19]. Lice examination in both mentioned season shows, that *Bovicola caprae* is most prevalence on goat while in autumn is less than in spring and might be due to in spring these animal are not shorn yet, in contrast to autumn, [19] Urmia in Iran and [17] in Sulaimani in Kurdistan region-Iraq, they founds in that *Bovicola caprae* is most prevalence lice on the goat with 71.4% which is like to our observation, also is agree with result of the study in Duhok in Kurdistan region, which pointed that *Bovicola caprae* is most distributed on local goat by 80.7% [3].

In the results variance between infested and control animal and also between individual effect of each ectoparasite in about of biochemical values (Serum protein, albumin, globulin, Zinc and Copper) were determined and illustrated in (Table 2&3).

Table 2: Effects of ectoparasites on Serum protein and some trace elements.

Parameters	Non Infested C.I (95%)	Infested C.I (95%)
S. Protein (µg/dl)	7.32±0.07 (7.17-7.46)	7.12±0.08 (6.94-7.29)
Albumin (µg/dl)	4.34±0.04 (4.25-4.44)	4.12±0.03** (4.04-4.20)
Globulin (µg/dl)	2.97±0.08 (2.80-3.13)	3.04±0.09 (2.84-3.23)
Zinc (µg/dl)	57.21±1.96 (53.25- 61.16)	48.97±1.20** (46.54- 51.39)
Copper (µg/dl)	127.02±2.35 (122.29- 131.76)	114.15±3.75** (106.60- 121.71)

(** is signs to presence significance differences at $p \leq 0.01$)

Despite that these values are declined slightly about to reference values but they having differences according to their situation which are in serum protein value (7.12±0.08µg/dl) of infested goat shown decreases and globulin value increases (3.04±0.09µg/dl) but not enough to make any differences ($p \geq 0.05$) while albumin value (4.12±0.03µg/dl) emerges reduction statistically ($p \leq 0.01$) in naturally infested goat with compare to control goat. In Zn and Cu, infested goats shows decrease in their levels (48.97±1.20 µg/dl and

114.15±3.75 µg/dl) sequentially and variation in their levels enough to make highly significance differences ($p \leq 0.01$) as compare to non infested goat.

Table 3: Effects of tick, lice and mixed of them on serum protein and some trace elements.

Parameters	Tick C.I (95%)	Lice C.I (95%)	Mix C.I (95%)
S. Protein (µg/dl)	7.10±0.19 (6.68-7.52)	7.22±0.11 (6.99-7.45)	6.89±0.20 (6.44-7.34)
Albumin (µg/dl)	4.11±0.05 (4.01-4.22)	4.13±0.08 (3.94-4.32)	4.11±0.09 (3.89-4.33)
Globulin (µg/dl)	2.97±0.20 (2.52-3.42)	2.95±0.28 (2.31-3.60)	3.10±0.11 (2.87-3.33)
Zinc (µg/dl)	48.89±1.29 (46.24-51.55)	52.74±3.49 (44.95-60.53)	45.67±2.40 (40.38-50.96)
Copper (µg/dl)	110.48±8.90 ^a (90.89-130.07)	121.82±3.63 ^a (114.35-129.30)	99.33±9.86 ^b (106.60-121.71)

(Different letters are signs to presence differences significantly at $p \leq 0.05$).

Goat which naturally infested with mixed (Tick and Lice) ectoparasite at the same time, shown decrease in value of serum protein (6.89±0.20 µg/dl), albumin value (4.11±0.09 µg/dl) with increases in serum globulin value (3.10±0.11 µg/dl), with compare to goat which infested only with tick or merely with lice, but without any statistical differences ($p \geq 0.05$) among them. In the previous table that, goat which naturally infested with mixed ectoparasite (tick and lices) at the same time, shows decrease in Zn (45.67±2.40 µg/dl) and Cu (99.33±9.86 µg/dl) levels, with comparing to goat which infested only with tick or merely with lice, but without any significance differences ($p \geq 0.05$) in Zn among them, while in Cu has significance differences ($p \leq 0.05$) when comparing to their values in goat which infested with only ones of these ectoparasite. These results are contrast to result of the study which is done by [20, 21] as they stated in their study, were serum protein is increased significantly ($p \leq 0.05$) and ($p \leq 0.01$) respectively, while the present results have supporting by some results of the same study as albumin decreased with highly significance differences ($p \leq 0.05$) and ($p \leq 0.01$) respectively and increases of globulin in goat and sheep infested with ectoparasite, with a compare to control group. Present study in agreement with [22] as they showed decrease of serum protein and significance decrease ($p \leq 0.05$) of albumin in infested goat, as compare to control goats while our results not agreed with decline globulin as in this study mentioned, also is contrast to observation of [17] as they detect of serum globulin decreased. The present study is agreed with its reached by [1] in infested sheep and [4] in the infested goat, as they said that, serum protein and albumin decreased and globulin increased significantly ($p \leq 0.05$) but in our results is not significantly ($p \geq 0.05$) in serum protein and globulin. As [21] were stated that, increases of serum globulin is a sign of development response of antibody to antigen presence in the area. Decrease of albumin and serum protein might be also related to malnutrition as [22] they emphasis in their work, also as [1] illustrated in his investigation that decrease of serum

protein might feature of increasing blood cortisol in an infected animal, hence some clues said that elevation of cortisol led to protein catabolism and then nitrogen imbalance, ultimately increases secretion of nitrogen through the urinary tract, while as [17] stated that decrease of serum protein and its differentials might be related to liver dysfunction as a primary and secondary impact of parasites as diarrhea, fever and loss of appetite.

In the Measureable reduction of zinc and copper in the infested goat statistically ($p \leq 0.01$) in compares with control goats, the present study is parallel to which it reached by [1] in high zinc decreased ($p \leq 0.01$) in infested sheep with compare to non infested sheep in Sulaimani and also agree with the same cached result by [10] in the diseased animal. Also the present study is absolutely concur to [23] was observed highly decreased in Zn and Cu, statistically ($p \leq 0.01$) in infected sheep, also agree with [24] as they detected significance differences ($p \leq 0.05$) in some trace elements particularly in Zn, in infested goats, while our results are vary to [25] as they observed, increase of Cu with significance differences ($p \leq 0.05$) and decreases of Zn without any significances ($p \geq 0.05$) in diseased sera in comparing with healthy sera. As in the Table 3 was illustrated, in all results, influence of lice is less than both mixed infestation and tick infested goat, this result have agreement with [17] but with varying in serum protein as in their study effect of lice are more on this parameter than ticks, except of copper whole other parameters (serum proteins and zinc) has not any differences ($p \geq 0.05$) among them. This variation of effects and minimal impact of lice might be related to its types as in this study merely present on genus of chewing lice *Bovicola caprae* and also its not sucking blood, mainly has secondary effects on blood parameters as [26] pointed in their study. Reduction of zinc concentration also can seen as hepatic disorders as [27] stated that, also as mentioned in FAO and WHO [28] that 70% of Zn and Cu are bound with albumin and any alteration of albumin as in this study showed statistically remarkable decreased ($p \leq 0.01$) in infested goat, led to decrease of these trace elements as a secondary infestation. Zn declined might be reverses to immune response for any infections [10]. Nutrition and especially in animal which fed on natural pasture and grazing are the most factors to fluctuating trace element in the animal blood as [1] is mentioned in his research that low content of each trace element in pasture might be predisposing the factor to decrease its concentration in animal, also alkaloid soil or PH above 6.5 makes obstacle to absorption of Zn, Cu and some other elements by the plant and ultimately low concentration in serum of animal. Forage plants which increase in calcium concentration is another factor to decrease in the some trace element especially in Zn. Interaction as cooperation and antagonism between elements are major factors to imbalance and deficiency of any of them in animal blood, as Mustafa [1] that high calcium or high calcium-phosphorus intake led to less absorption of Zn. Decrease of trace element in control animals might be due to mal absorption or as [29] and [23] mentioned that is due to animals are not benefit of trace element in their feeding and water, and also cadmium, molybdenum or any heavy metals can limit of

absorption and normal concentration of any trace element especially Cu, Fe and Zn or interaction in them as level of cobalt and Cu, cadmium, manganese limit of Fe absorption.

4. CONCLUSION

In this study that *Rhipicephalus* spp and *Bovicola caprae* were most prevalence on goat in Sulaimani-Kurdistan region of Iraq. Also present study shows marked impacts of ectoparasites on the biochemical values of local goat. Mixed infestation and tick infested goat were mostly affected than infestation of lice and it might be related to the type of lice. More investigation required to detecting ectoparasites effect on another trace element and biochemical parameters, also in various periods or twice as early and late infestation, for this purpose animal tagging (numbering) is required.

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