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# Ticks (Acari: Ixodidae) Infesting Sheep and Goats in Nyala Town, South Darfur, Sudan

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## Abstract

Sudan is a large country with appreciable population numbers of sheep and goats. Ticks and tick-borne diseases constitute a real threat to mutton production in this country. The current study was designed to survey species of ticks infesting sheep and goats in Nyala town, South Darfur, Sudan during the period of March 2006 to February 2007. Hundred animals on a monthly basis (50 sheep and 50 goats) were examined. Three tick genera and ten species were identified. These were *Rhipicephalus guilhoni (71.7%), Rhipicephalus camicasi (7.97%), Rhipicephalus evertsievertsi (9.02%), Rhipicephalus* (*Boophilus*) *decoloratus (6.41%), Rhipicephalus* (*Boophilus*) *annulatus (3.66%), Hyalomma marginatum rufipus (0.38%), Hyalomma detritumdetritum (0.20%), Hyalomma dromedarii (0.20%), Hyalomma excavatum (0.20%)* and *Amblyomma variegatum (0.26%).* None of *H. marginatum, H. detritumdetritum, H. dromedarii* were found to infest goats. The individual species of ticks identified in the present survey exhibited a diverse pattern of prevalence and seasonal abundance in response to climatic variables throughout the study period. There was no significant difference in numbers of ticks infested males and females of sheep and goats. It was concluded that South Darfur State in Sudan is a conducive area for establishment of hard ticks that infest small ruminants.

**Keywords**: Ticks seasonality, sheep and goats, Sudan



## Introduction

Ticks and tick–borne diseases are major constraints to livestock improvement in many parts of the world especially in the tropics (Uilenberg, 1995). Tick–borne diseases (theileriosis and babesiosis), reckettsial diseases (Anaplasmosis and cowdriosis) as well as direct effect of ticks infestation, are the major health and management problems affecting productivity of livestock in many developing countries (de Castro, 1997). Ticks and tick–borne diseases are widespread in the Sudan and constitute substantial obstacles to the development of mutton production. The most important tick–borne diseases in the Sudan are malignant ovine theileriosis, cowdriosis and babesiosis. However, economic knowledge about ticks and tick–borne diseases is still fragmentary and far from complete. The large number of tick species, the multiplicity of transmitted agents and the diverse eco-climatic zones of the Sudan provide a unique opportunity to host diverse research activities that could benefit


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other regions in Africa (El Hussein *et al*., 2004).

Ticks constitute the most important livestock pest in Africa and found in the entire 30 million square kilometers of the African continent (Mohammed, 2003). Since the major study of Hoogstraal (1956) on ticks of the Sudan and study of Osman (1978) on ticks of Darfur province, no systematic research has been done on distribution and seasonal occurrence of ixodid ticks of small ruminants in South Darfur State. However, some epidemiological studies on ticks were done in cattle (Musa *et al*., 1996). Studies on the seasonal occurrence of the various developmental stages of ticks are of great significance in the epidemiology of tick-borne diseases and in planning appropriate tick control measures (Norval *et al.,* 1991). The present study conducted to identify tick species infesting sheep and goats in Nyala, South Darfur, to elucidate their seasonal population changes and pattern of spread.

**Materials and Methods**

**Study area:**

This study was conducted in Nyala, South Darfur State, Western Sudan (24º 53′ E, 12º 03′) during the period from March 2006 to February 2007. The meteorological data of 40 years obtained from Nyala station showed that the mean minimum and maximum temperatures were 20.98℃ and 35.14℃ respectively. The lowest temperatures were reported in January and February while the highest temperatures were reported in May. The annual relative humidity and total rainfall were 35.58% and 402.49 mm respectively. The lowest and the highest relative humidity were reported in February and July while the annual rainfall peaked in August and declined to zero or near zero in November, December, January, and February.

**Tick collection:**

Total body tick collection was carried out from resident sheep and goats in Nyala encountered slaughter house. A total of 50 adult desert sheep and 50 adults' desert goats were randomly chosen for collection monthly for one year, using a pair of blunt forceps. The collected ticks were kept in vials with 70% ethyl alcohol. Each vial was labeled indicating season, breed, age, sex, and date of collection. The collected ticks were identified under a dissecting microscope (Nikon, Japan) according to the methods described by Hoogstraal (1956), Walker *et al.,* (2000) and Walker *et al.,* (2003). The ticks obtained from each animal were recorded according to genera, species and sex.

**Statistical analysis:**

Data collected on ticks associated with sheep and goats were analyzed using procedure of statistical package for Social Science (SPSS), version 14 USA. The SPSS was used to perform analysis of variance (ANOVA) while means separation was performed using Duncan multiple range test. The *T*-Test was also used to compare means ticks per head of sheep and goats. Correlation analysis was carried out to relate tick count with season, month and type of animal and between means and climatic factors. Levels of significance were taken at ($P \leq 0.05, 0.01$).

**Results**

**Tick survey:**

The prevalence of ticks infecting sheep and goats in Nyala was depicted in Table (1). Out of 1200 sheep and goats examined, 49.5% (297) and 20.17% (121) of sheep and goats, respectively, were found infested with hard ticks. The overall prevalence was 34.83% (418). Three tick genera and ten species were identified. These genera were *Rhipicephalus* (98.61%), *Hyalomma* (0.98%) and *Amblyomma* (0.26%). The tick species included *R. guilhoni (*71.70%), *R. evertsievertsi* (9.02%), *R. camicasi* (7.97%), *R.* (*B*) *decoloratus* (6.41%), *R.* (*B*) *annulatus* (3.66%), *A. variegatum* (0.26%), *H. m. rufipus* (0.38%) *H. dromedarii* (0.20%), *H. detritumdetritum* (0.20%) and *H. excavatum*


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(0.20%). The overall prevalence of ticks was highest in sheep (75.69) than in goats (24.31).

**Table 1: Abundance of adult ticks infesting sheep and goats in Nyala during the survey period March, 2006 – February, 2007**

| Tick species | Sheep No. (%) | Goats No. (%) | Total No. (%) |
|---|---|---|---|
| *R. guilhoni* | 846 (73.1) | 251 (67.6) | 1097 (71.7) |
| *R. camicasi* | 0078 (6.8) | 044 (11.8) | 00122 (7.9) |
| *R. e. Evertsi* | 0068 (5.9) | 070 (18.8) | 00138 (9.0) |
| *R.* (*B*) *decoloratus* | 0096 (8.3) | 0002 (0.5) | 00098 (6.4) |
| *R.* (*B*) *annulatus* | 0054 (4.7) | 0002 (0.5) | 00056 (3.7) |
| *A. variegatum* | 0002 (0.2) | 0002 (0.5) | 00004 (0.3) |
| *H. dromedarii* | 0003 (0.3) | 0000 (0.0) | 00003 (0.2) |
| *H. detritumdetritum* | 0003 (0.3) | 0000 (0.0) | 00003 (0.2) |
| *H. excavatum* | 0002 (0.2) | 0001 (0.3) | 00003 (0.2) |
| *H. m. rufipus* | 0006 (0.6) | 0000 (0.0) | 00006 (0.4) |
| Total | 1158 (75.7) | 372 (24.3) | 1530 (100) |

**Abundance of ticks:**

Table (2) shows abundance of ticks identified from sheep and goats in Nyala town. Sheep infested with all ten tick species identified which were in descending order *R. guilhoni* (73.06%), *R.* (*B*) *decoloratus* (8.29%), *R. camicasi* (6.74%), *R. e. evertsi* (5.87%), *R.* (*B*) *annulatus* (4.66%), *H. m. rufipus* (0.52%), *H. detritumdetritum* (0.26%), *H. dromedarii* (0.26%), *A. variegatum* (0.17) and *H. excavatum* (0.17%). Only two males of *A. variegatum* and two males of *H. excavatum* were recorded. At the same time *R. guilhoni* was found in very high numbers (846). Sheep carried significantly more ticks species particularly *R. guilhoni, R.* (*B*) *decoloratus, R.* (*B*) *annulatus* than goats ($P \leq 0.05$). There was no significant difference in mean numbers of ticks per head and *R. camicasi* carried by the two types of examined animals (Table 2). Goats were infested with the following ticks in descending order, *R. guilhoni* (67.47%), *R. evertsievertsi* (18.82%) and *R. camicasi* (11.83%). Other ticks found in very low numbers were *A. variegatum* (0.54%0), *R.* (*B*) *decoloratus* (0.54%), *R.* (*B*) *annulatus* (0.54%) and only one male of *H. excavatum* (0.27%) was recorded. None of these species: *H. dromedari, H. detritumdetritum* and *H. m. rufipus* were found in goats, while *R. guilhoni* was found in higher numbers (251). Goats carried significantly more *R. evertsievertsi* than sheep (Table 2).

**Table 2: Means (±SE) of ticks collected from Sheep and goats in Nyala during the survey period March, 2006 – February, 2007**

| Animal | *R. guilhoni* | *R. camicasi* | *R. e. evertsi* | *R.* (*B*) *annulatus* | *R.* (*B*) *decoloratus* | Mean total |
|---|---|---|---|---|---|---|
| Sheep | $2.87 \pm 0.21^a$ | $0.25 \pm 0.04^a$ | $0.23 \pm 0.05^a$ | $0.18 \pm 0.04^a$ | $0.31 \pm 0.06^a$ | $3.97 \pm 0.22^a$ |
| Goats | $2.00 \pm 0.23^b$ | $0.34 \pm 0.09^a$ | $0.59 \pm 0.19^b$ | $0.02 \pm 0.00^b$ | $0.02 \pm 0.00^b$ | $3.28 \pm 0.31^a$ |

Means (±SE) followed by the same letter in each column are not significantly different at 5% level based on Duncan's test. Number of observation = 418 for each type of animal.

**Ticks seasonality:**

The mean of total body collected ticks per head of sheep and (both sheep and goats in) cool-dry (winter) was significantly ($P \leq 0.05$) higher than those collected in hot-wet (autumn) and in hot-dry (summer), and the


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means in hot-wet were not significantly differences from means in hot-dry. In the case of the goats the means of total body collected ticks were significantly higher in winter than in both hot-wet and hot-dry. However, the means in hot-dry was significant lowest than means in hot-wet (Table 3). Means total number of *R. guilhoni* and *R. camicasi* collected in cool-dry from both species were significantly higher than those collected in hot-dry and hot-wet ($P \leq 0.05$) and those collected in hot-wet were higher but not significant than those collected in hot-dry ($P \geq 0.05$). However, the collected parasite in hot-dry was less than in winter and hot-wet. On the other hand, Means *R.* (*B*) *decoloratus, R.* (*B*) *annulatus* and *R. e. evertsi* in hot-dry were significantly higher than those collected in winter and hot-wet. Moreover, there was no significant difference between means in cool-dry and hot-wet. Furthermore, *R. guilhoni* and *R. camicasi* showed a significant positive correlation ($P \leq 0.01$, $r = 0.306$ and $r = 0.183$) with season respectively. In contrast, no correlation with season was recorded in *R.* (*B*) *decoloratus, R.* (*B*) *annulatus* and *R. e. evertsi.*

**Table 3: Means (± SE) of total ticks collected from sheep and goats in different seasons in Nyala South Darfur during the survey period March, 2006- February, 2007**

| Animal | No. tested | Hot-dry | Hot-wet | Cool-dry |
|---|---|---|---|---|
| Sheep | 297 | $2.56 \pm 0.25^{a}$ | $3.55 \pm 0.43^{a}$ | $4.85 \pm 0.33^{b}$ |
| Goats | 121 | $1.89 \pm 0.31^{a}$ | $2.50 \pm 0.44^{ab}$ | $4.09 \pm 0.48^{b}$ |
| Mean total | 418 | $2.41 \pm 0.21^{a}$ | $3.25 \pm 0.33^{a}$ | $4.61 \pm 0.27^{b}$ |

Means (±SE) followed by the same letter in each cell are not significantly different at 5% level based on Ryan's Q test (REGWQ).

The prevalence of total body tick collected from sheep was in descending orders highest in January (78%), December (72%), February (70%), November (68%), March (66%), August (62%), September (50%) and July (44%), while the lowest prevalence was found in June (14%), May (20%), October (24%) and April (26%) (Table 4).

**Table 4: Prevalence of total body tick collection from sheep and goats in different months during the survey period March, 2006- February, 2007 in Nyala**

| Month | Sheep | Goats | Total |
|---|---|---|---|
| | No. +ve (%) | No. +ve (%) | No. +ve (%) |
| March 2006 | 33 (66) | 9 (18) | 42 (42) |
| April 2006 | 13 (26) | 2 (4) | 15 (15) |
| May 2006 | 10 (20) | 1 (2) | 11 (11) |
| June 2006 | 7 (14) | 6 (12) | 13 (13) |
| July 2006 | 22 (44) | 4 (8) | 26 (26) |
| August 2006 | 31 (62) | 12 (24) | 43 (43) |
| September 2006 | 25 (50) | 16 (32) | 41 (41) |
| October 2006 | 12 (24) | 4 (8) | 16 (16) |
| November 2006 | 34 (68) | 23 (46) | 57 (57) |
| December 2006 | 36 (72) | 19 (38) | 55 (55) |
| January 2007 | 39 (78) | 11 (22) | 50 (50) |
| February 2007 | 35 (70) | 14 (28) | 49 (49) |
| Total | 297 (71.1) | 121 (28..9) | 418 (34.8) |

Number of observation = 50 for each type of animal.


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In the case of goats the prevalence was highest in November (46%), December (38%), September (32%), February (28%), August (24%) and January (22%) while the lowest was found in May (2%), April (4%), July (8%), October (8%), June (12%) and March (18%). Nevertheless, the overall prevalence was highest (57%) in November, (55%) in December and (50%) in January. The lowest (11%) was in May, (13%) in June and (15%) in April (Table 4). On the other hand, there was no significant difference in number of ticks infesting male and female of sheep and goats (Table 5).

**Table 5: Means (± SE) ticks collected from different sexes of sheep and goats in Nyala South Darfur state during the survey period March, 2006 – February, 2007**

| Animal sex | Sheep | | Goats | | Mean total |
|---|---|---|---|---|---|
| | No. | Mean | No. | Mean | |
| Male | 126 | 4.33 ± 0.36[a] | 70 | 3.30 ± 0.44 [a] | 3.98 ± 0.28[a] |
| Female | 171 | 3.69 ± 0.27[a] | 51 | 3.25 ± 0.42[a] | 3.58 ± 0.23[a] |

Means (±SE) followed by the same letter in each column are not significantly different at 5% level based on Duncan's test.

There was a highly significant negative correlation (P ≤ .01) between maximum and minimum temperatures with *R. guilhoni* (-.268, -.285), R. *camicasi* (-.150, -.177), total number of ticks (-.241, -.273) respectively (Table 6). Nevertheless, a significant negative correlation was detected between *R. guilhoni* (P ≤ .05, r = -.065, r = -.068), *R. camicasi* (P ≤.01, r = -.078, r = .095), *R.* (*B*) *decoloratus* (P ≤.01, r = -.104, p ≤.05, r = -.065), total number of ticks (P ≤.01, r =-.100, r = -.093) with relative humidity and rain fall respectively. Significant correlation was also detected between *R.* (*B*) *annulatus* (P ≤.01, r = -.070) and relative humidity. Other tick species were significantly not correlated with meteorological data (Table 6).

**Table 6: Correlation analysis between ticks collected from sheep and goats in 2006 -2007 in Nyala town with metrological data.**

| Tick species | Temperature | | Relative humidity% | Rain fall in mm |
|---|---|---|---|---|
| | Maximum | Minimum | | |
| *R. guilhoni* | -.268** | -.285** | -.65* | -.068* |
| *R. camicasi* | -.150** | -.177** | -.078** | -.095** |
| *R. e. Evertsi* | .006 | .009 | -.002 | -.005 |
| *R.* (*B*) *decoloratus* | -.005 | -.048 | -.104** | -.065* |
| *R.* (*B*) *annulatus* | .048 | .028 | -.070* | -.034 |
| Total ticks | -.241** | -.273** | -.100** | -.093** |

* = P ≤ 0.05 ** = P ≤ 0.01

## Discussion

In South Darfur State, sheep and goats are kept under nomadic system and pastoral grazing, they are owned by various tribes. These tribes follow different routes and stay at certain domain during winter in the northern part and they reach Raja and Central Africa and Chad during summer season (Musa, 2002). Small ruminants have good production potentials, for instance, the


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average daily live weight gain for Ambararow fatting lamb was 216 gram and the dressing out percentage was 45.5 (Musa, 2002). In this region, desert sheep and goats are frequently infected with parasitic infections which have been extensively covered (Ismail *et al.*, 2004; Abakar *et al.*, 2005; Suliman, 2008; Abdel Wahab *et al.*, 1998; Abdel Almalik *et al*., 2008; Hassan, 2012). However, there are meager information on the prevalence and effects of ticks infesting small ruminants in South Darfur State.

The present systematic study reveals ten tick species infesting sheep and goats in Nyala. This finding was similar to those reported by Osman, 1978; Osman *et al*., 1982; Jongejan *et al*., 1987; Salih *et al*., 2004) in Darfur, Kordofan, along White and Blue Nile banks and in northern Sudan respectively. The variety of tick species recorded in this study may be attributed to the fact that the animals had been kept under free-range husbandry a fact that may imply that the animals could have picked ticks from a wide range of ecological zones. However, some species were more extensively distributed than others. This finding was apparent in the case of *R. guilhoni* that was more widely distributed throughout of year with peak population in the Winter.

Moderate numbers of *R. evertsievertsi* were recorded in this study throughout the year with a peak population during the hot dry season. This implies that these ticks are wide spread in South Darfur with less evidence of climatic factors effects. Walker *et al*. (2003) reported that R. *evertsievertsi* occurs in regions with savannah and temperate climates, typically in grass lands and wooded areas used as cattle pasture. The study revealed small number of *R.* (*B*) *annulatus* through out the study period. Walker *et al*. (2003) reported that cattle are the main host of *R.* (*B*) *annulatus* and *R.* (*B*) *decoloratus* but occasionally sheep and goats can support successful completion of the life cycle. Both *R.* (*Boophilus*) spp. as well as *R. evertsievertsi* were found throughout the year with a peak population during the hot dry season, this finding indicates that these species adapted themselves to high temperature. *A. variegatum* was found in lowest number. The findings is not surprising, as this species has been reported from western Sudan (Hoogstraal, 1956; Osman *et al*., 1982; Musa *et al*., 1996; Abdel Wahab *et al*., 1998), and the finding of this species in low numbers may attributed to the fact that small ruminants are not preferable host for this parasite. Fewer numbers of *H. dromedarii* were collected; this could indicate that sheep and goats are not preferable hosts to this tick species which prefer camels as hosts for feeding (Walker *et al*., 2003).

Small numbers of *H. detritumdetritum* were also reported for the first time in western Sudan region. *H. detritumdetritum* occurs in the areas with Mediterranean climate of northern Africa from Morocco to Tunisia (Walker *et al*., 2003). It also occurs in the desert and steppe climate areas of northern-central Sudan (Salih *et al.,* 2004). This finding indicated that this tick species has extended its range to include western part of the Sudan. Salih *et al.* (2004) reported that major ecological changes have occurred due to extensive animal movement, deforestation, desertification and establishment of mechanized agricultural schemes and these factors have certainly affected the distribution of ticks and tick-borne diseases in the Sudan.

In the current investigation, seasonal prevalence of ticks in sheep and goats was observed during hot-wet (July to October) and cool-dry (November to February). The result was on line with Vathsala *et al*. (2008) in Tamil Nadu, India and Mohammed and Hassan (2007) in Sennar state, Sudan. Soulsby (1982) reported that each species of ticks is adapted to different macro and micro climate, with some occurring only in warm


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region with affair degree of humidity, while other are most active in dry climates, this fact is very clear in the present study, when correlation analysis between ticks collected from animals and meteorological data of the study area was found out. However, a highly significant correlation between *R. guilhoni, R. camicasi,* and *R.*(*B*) *decoloratus* with both maximum and minimum temperatures, relative humidity and rain fall was found as well as total number of ticks with meteorological data. The finding that infestation was more in cool-dry may be attributed to the fact that the effect of temperature is more evidence than humidity. Sheep was found to be more infested by ticks than the goats, this finding may attributed to the method of animal husbandry whereby goats are confined within the villages reduced their chance of being exposed to ticks, more over the wool coat of sheep may provide suitable and good environment for ticks infestation. Also may be attributed to the type of husbandry of sheep which always feed on the grasses.

In conclusion, the present work showed that hard ticks are quite prevalent among sheep and goats in South Darfur. The climatic conditions and husbandry systems adopted seem to have a great contribution to the establishment and acquirement of four genera and ten species by small ruminants among of which *R. guilhoni* and *R. evertsievertsi* are the predominant parasites.

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**References**

Abakar, A.D., Seri, H.I., Isma, A.A. and Musa, H.H. (2005). Comparative efficacy of selected anticoccidial drugs in Ambarorow sheep naturally infected with enteric coccidia in South Darfur. *Sudan Journal of Veterinary Research,* **20**: 61-67.

Abdallah, M.A.A. (2005). *Prevalence of Blood Parasites in Domestic Animals in South Darfur State of Sudan*. M.V.Sc. Thesis, University of Khartoum.

Abdel Almalik, A.H., Bashar, A.E. and Abakar, A.D. (2008). Prevalence and dynamics of some gastrointestinal parasites of sheep and goats in Tulus area based on post-mortem examination. *Asian Journal of Animal and Veterinary Advances,* **3** (6): 390-399.

Abdel Wahab, M.B., Musa, M.T., Kheir, S.M. and Elgadal, A.A. (1998). An associatiilon of heartwater with outbreak of theileriosis in cattle in western Sudan. *Sudan Journal of Veterinary Research,* **15**: 21-24.

Animal Censes (2006). Office of Statistics Ministry of Animal Resources, Khartoum, Sudan.

Binni, E.A., Yagi, A.L. and Mohammed, A.S. (2010). The influence of temperature and humidity on oviposition and hatchability of *Amblyomma lepidem* (Dönitz, 1808) (Acarina: Ixodidae) under laboratory condition. *Veterinary Parasitology*, **170**: 344-347.

De Castro, J. J. (1997). Sustainable tick and tick–borne diseases control in live stock improvement in developing countries. *Veterinary Parasitology*, **71**: 77–97.


ISSN (Print): 1858 6775
eISSN (Online): 1858-8775

El Hussein, A.R., Majid, A.M., Shawgi, M.H. (2004). Present status of tick-borne diseases in Sudan. *Archives de l'Institut Pasteur de Tunis,* **81**(1-4): 31-4.

Flach, E.J. and Ouhelli, H. (1992). The epidemiology of tropical theileriosis (*Theileria annulata* infection in cattle) in an endemic area of Morocco. *Veterinary Parasitology,* **44**: (1-2), 51–65

Hassan, S.A. (2012). *Some Parasitlogical Studies on Some Internal Parasites of Sheep in Nyala Town, South Darfur State*. M.V.Sc, thesis, University of Nyala.

Hoogstraal, H. (1956). African Ixodoidea. 1. Ticks of the Sudan (with special reference to Equatoria Province and with preliminary reviews of the genera *Boophilus, Margaropus* and *Hyalomma*). Dept. Navy, Bur. Med. Surg. Washington, DC, USA, 1101 Pp.

Imam, A.H. (2003). Ecological studies on ticks (Acari: Ixodidae) infesting cattle in Kosti Province, Sudan. *Sudan Journal of Veterinary Science and Animal Husbandry,* **42**(1&2):68.

Jongejan, F., Zivkovic, D., Pegram, R. G., Tatchell, R.J., Fison, T., Latif, A.A., and Paine, G. (1987). Ticks (Acari: Ixodidae) of the Blue and white Nile ecosystem in the Sudan with particular reference to the *Rhipicephalus sanguineus*group. *Experimental and Applied Acarology*. **3**: 331-346.

Khider, O. R. (2000). Some aspects of red meat production in the Sudan (Processing and Marketing). Symposium of the use of new technology for the increase of red meat production. The Arab Association for Investment and Agricultural Development.

Mohammed, A.S. (2003). Economic importance of hard ticks. A review. *Sudan Journal of Veterinary Science and Animal Husbandry*, **42** (1&2): 261 – 267.

Mohammed, A.S. Almalik, K. H. and Hassan, S.M. (2009). Development of the immature stages of *Amblyomma lepidum* (Acari: Ixodidae) under field conditions. *Veterinary Parasitology*, **165**: 109-111

Mohammed, S.M. and Hassan, S.M. (2007). Distribution and population dynamics of ticks (Acari: Ixodidae) infesting sheep in Sennar State, Sudan. *Onderstepoort Journal of Veterinary Research*, **74**:301-306.

Musa, H.H. (2002). *Observation on Reproductive and Productive Performance of West African Dwarf Sheep in Southern Darfur*. M.Sc., Thesis, University of Khartoum.

Musa, M. T., Bashar, A. E. and Mohamed, Y. O. (1996). Heartwater in cattle in western Sudan: A etiology and ecological observation in two out breaks. *Sudan Journal of Veterinary Science and Animal Husbandry,* 35:113-123.

Norval, R.A.I., Andrew, H.R. and Meltzer, M.I. (1991). Seasonal occurrence of the bont tick (*Amblyomma hebraeum*) in the southern lowveld of Zimbabwe. *Experimental and Applied Acarology*, **13**:81–96.

Osman, O.M. (1978). Preliminary notes on the distribution of ticks (Acari: Ixodidae) in Darfur Province, Sudan. *Bulletin of Animal Health and Production Africa*. **26**: 329-333.

Osman, O. M.; El Hussein, A .M.; Neima, A. and Abdulla, A. S. (1982). Ecological studies on ticks (Acarian: Ixodidae) of Kordofan region, Sudan.

*Bulletin of Animal Health and Production Africa*. **30**: 45-53.

Preliminary survey of ticks (Acari: Ixodidae) on cattle in northern Sudan. *Onderstepoort Journal of Veterinary Research*. **71** (4): 319–26.

Soulsby, E. J. L. (1982). Helminthes, Arthropods and protozoa of domesticated animals. Bailliere Tindall. 7th ed. London.

Suleiman, N.M. (2008). *Some Studies on Ticks Infesting Goats with Emphasis on Cowdria ruminantium Infection in Nyala Town.* M.V.Sc, Thesis, University of Nyala.

Uilenberg, G. (1995). International collaborative research: significance of tick-borne hemoparasitic diseases to

Salih, D.A., Hassan, S.M., El Hussein, A.M. and Jongejan, F. (2004). world animal health. *Veterinary Parasitology*. **57,** 19-41.

Vathsala, M.; Mohan, P., Sacikumar and Ramessh, S. (2008). Survey of tick species distribution in sheep and goats in Tamil Nadu, India. 242.

Walker, A. R.; Bouattour, A.; Camicas, J. L.; Estrada-Pena, A.; Horak, I. G.; Latif, A. A.; Pegram, R. G. and Preston, P. M. (2003). Ticks of domestic animals in Africa: A Guide to identification of species. Bioscience reports Pp. 221.

Walker, J.B., Keirans, J.E. and Horak, I.G. (2000). The genus *Rhipicephalus* (Acari, Ixodidae): *A guide to the brown ticks of the world*. Cambridge: Cambridge Academic Press.


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# القراد الصلب الذي يصيب الضان و الماعز في مدينة بنيالا–ولاية جنوب دارفور– السودان

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**المستخلص:**

يعد السودان من البلدان الشاسعة التي تذخر باعداد مقدرة من الضان والماعز ويشكل القراد والامراض المنقولة بواسطتة تهديداً حقيقياً لصناعة اللحوم الحمراء في هذا البلد. صممت الدراسة الحالية لمسح القراد الصلب الذي يصيب المجترات الصغيرة بمنطقة نيالا –ولاية جنوب دارفور. جمعت العينات من الضان والماعز خلال فترة الدراسة والتي امتدت لعاماُ كامل حيث تم جمع مئة عينة من الضان والماعز كل شهر(50 عينة من كل فصيل) وحفظت في محلول كحولي بتركيز قدرة 70% وتم التعرف علي القراد اعتماداً علي خصائصة الشكلية. بلغت نسبة الاصابة في الضان 49.5% بينما كانت نسبة الاصبة في الماعز 20.17% و شكلت الاصابة العامة بالقراد الصلب في المجترات الصغيرة % 34.38 . تم التعرف علي ثلاثة اجناس وعشرة انواع من القراد الصلب ، والاجناس هي : ( *Boophilus* ) *Rhipicephalus* و *Hyalomma* و *Amblyomma* بينما الانواع هي *Rhipicephalus guilhoni(71.70%),* *Rhipicephalus camicasi (7.97%)* , *Rhipicephalus evertsi (9.02%)* , *Boophilus decloratus(6.41%)* , *Boophilus annulatus (3.66%)* , *Hyalomma marginatum rufipus(0.38%), Hyalomma detritumdetritum (0.20%)* , *Hyalomma dromedari(0.20%), Hyalomma excavatum (0.20%) and Amblyomma variegatum(0.26%).* وكانت نسبة الاصابة مر تفعة في الضان منها في الماعز. اظهرت الانواع التي تم التعرف عليها في هذه الدراسة انماط مختلفة من نسب الاصابة والحركيه بالمقارنة مع الظروف المناخية وليس هناك فروق معنويه بين الاعداد من القراد التي جمعت من الذكور والاناث . حلصت الدراسة الي ان ولاية جنوب دارفور تشكل ارضية خصبة لنمو وتطور اربعة اجناس من القراد الصلب الذي يتطفل علي المجترات الصغيرة في مدار العام.


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