Incidence of Endo and Ecto Parasites of Ruminants on the University of Maiduguri Animal Farm, Nigeria.

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Abstract

This study was undertaken to determine the incidence of ectoparasites and endoparasites of ruminants on the University of Maiduguri animal farm. Ectoparasites were identified using microscopy while endoparasites were also identified using standard parasitology techniques. A total of 300 animals were examined. Results revealed an overall prevalence of 42%, 33% and 24% for cattle, sheep and goats respectively for ectoparasites in the study. Ectoparasites identified were ticks (*Boophilus* sp.,*Amblyomma* sp., *Hyalomma* sp., *Rhipicephalus* sp.),a flea (*Ctenocephalides* sp.) and a dipterid fly (*Muscadomestica*). Female animals had a significantly ($P<0.05$) higher infestation than males. Young sheep and goat also had a significantly ($P<0.05$) higher infestation rate than the adult, while in cattle, there was no significant difference between ages. No significant difference for ectoparasitism was observed amongst cattle breeds but Yankasa sheep had a higher prevalence of 33.3% than Ouda with 31.8% and Sokoto red had a higher prevalence of 27.3% than Borno White goats (20.0%). Amongst cattle and goats, the tail region was most infested while in sheep it was the ear region. Furthermore, the prevalence of faecal ova/oocysts revealed a significantly ($P<0.05$) higher rate amongst female animals than male. No significant differences in the prevalence rates between breed of cattle but Yankasa sheep and Borno white goats had significantly higher ($P<0.05$) prevalence than Ouda sheep and Sokoto red goats respectively. Conclusively, this study has identified potential risk factors associated with ruminant parasitism.

Keywords: Ectoparasites, Maiduguri, Nigeria, Ova/oocysts, Ruminants.

Introduction

Livestock production sector in Nigeria is vital for its economical benefits because majority of the population (>80%) are involved in Agriculture (Otuma and Udenwa, 2009). Livestock, particularly ruminants, provide a source of protein in terms of meat, milk and their by products for human consumption as well as hides and skin for the tannery industry.Parasites are organisms that live inside or on another organism called the "host" at whose expense they obtain nourishment and shelter and could be either ecto or endo parasites (Bhatia *et al.* 2010; Ohaeri and Ugwu, 2013). Parasites constitute a major constraint to livestock production in Nigeria (Fabiyi, 2007). Ruminants (sheep, goats and cattle) in Nigeria may be infected with a large array of parasites most importantly vector-borne and as well as gastrointestinal parasites.

Ectoparasites are organisms that live on the surface of bigger animals upon which they depend for food, shelter and other basic needs to survive (Rechav and

Nutall, 2000). Ectoparasites have direct effects and also transmit pathogens to their host by acting as vectors of diseases (Parola *et al*., 2001). As a result of their activities, arthropod ectoparasites may have a variety of direct and indirect effects on their hosts (Cornall and Wall, 2015). The health of animals in addition to the hides and skin quality by ectoparasites. The tannery industries have suffered great economic losses due to destruction of animal skin by ectoparasites (Tongjura *et al*., 2012). Ticks are the most important ectoparasites of farm animals in Nigeria. Heavy infestation rate causes damage to hide and skin, in addition to transmitting diseases to their host. Furthermore, fleas require blood meals for egg production and are found in crevices in floors or sleeping places of host animals (Tongjura *et al*., 2012). *Ctenocephalides* sp. and *Xenopsylla cheopis* are two species of fleas that have been reported in livestock especially goats in Nigeria (James-Rugu and Iwuala, 1995).

Small ruminant productivity is mostly affected by gastrointestinal nematode infections (GIN) mostly in the tropics and sub-tropics (Calvete *et al*., 2014). This is largely due to migration of the infective larvae after ingestion rather than the adult worms in the gut (Dube *et al*., 2002). Ruminants infected with internal parasites show a rough dull-coat, weakness, diarrhea, apathy, tail rubbing, signs of hypo-proteinaemia, submandibular oedema (bottle jaw), loss of appetite and weight loss. In addition to gastrointestinal nematodes, coccidiosis has also been known to infect livestock having moderate to high pathogenic effects (Radfar *et al*., 2011).Understanding of the epidemiology of disease causing agents is a prerequisite for the rational design of effective preventive and control programme against the disease. Hence this study was conducted to identify these parasites affecting ruminants on the University of Maiduguri Animal Farm.

Materials and Methods

Study Location

This study was conducted at the University of Maiduguri Animal Farmlocated within the University of Maiduguri. It is basically used for teaching as well as research. The farm consists of both large and small ruminants such as cattle, sheep and goats. The University is located along Bama Road in Jere Local Government Area of Borno State, Nigeria. Maiduguri has a temperature that ranges between 34^{o} to 42^{o}C with mean annual rainfall of 647 mm.

Sampling Procedure

A simple random sampling was used to examine 100 animals each of cattle, sheep and goats. The age, sex, and breed of each animal were determined using the methods as described by Haumesser and Gerbaldi (1980), Aganga *et al*. (1988), Blench (1999), Meghen *et al.* (1999) and Hassan and Hassan (2003). Ages were categorized as 1- 3 yrs for young and 4- 12 yrs as adult for cattle, 1- 2 yrs and 3-5 yrs for young and adult sheep and goats respectively. The study lasted for seven months, April to October, 2014.

Collection of Ectoparasites

These were handpicked using forceps or brushed out unto a clean white linen cloth, and the various predilection sites recorded. Samples were preserved in specimen bottles containing 2% formalin and identified in the Veterinary Parasitology and Entomology Laboratory, University of Maiduguri, using standard parasitological techniques (Urquhart *et al.,* 1990).

Endoparasites (Faecal ova/oocysts)
Faecal samples were also collected fresh from the rectum of individual animals using disposable hand gloves into specimen bottles containing 2% formalin.The sterile bottles were labeled with the approximate age, sex and breed and species of the animal. Faecal ova/oocysts were identified using standard procedure as described by Hansen and Perry, (1994) and Biu *et al*. (2009) at the Veterinary Parasitology and Entomology Laboratory, University of Maiduguri.

Results
Table 1 shows the results of single infestation of cattle, sheep and goats with ectoparasites. The prevalence observed was 30%, 22% and 18% for cattle, sheep and goats respectively (Table 1). The most prevalent ectoparasite for cattle and goats was *Boophilus* sp. while *Ctenocephalides* sp. was the most prevalent for Sheep. Other ectoparasites observed include *Amblyomma* sp., *Hyalomma* sp., *Rhipicephalus* sp. and *Musca domestica*. Mixed infestation of cattle, sheep and goats with ectoparasites are presented in Table 2. The overall prevalence of mixed ectoparasitic infestation are 12.0%, 11.0% and 6.0% respectively for cattle, Sheep and Goats (Table 2).

Table1: Single ectoparasite Infestation of Cattle, Sheep and Goats

Ectoparasites	**(%) of ruminants infested (n=100)**		
	Cattle	Sheep	Goats
Boophilus sp.	12	4	10
Amblyomma sp.	3	0	3
Hyalomma sp.	8	2	3
Rhipicephalus sp.	5	1	2
Musca domestica	2	0	0
Ctenocephalides sp.	0	15	0
Total	30	22	18

Table 2: Mixed Infestation of ectoparasites on Cattle, Sheep and Goats

Ectoparasite	**(%) of ruminants infested (n=100)**		
	Cattle	Sheep	Goats
Ctenocephalides sp. + *Amblyomma* sp.	0	1	0
Ctenocephalides sp.+ *Hyalomma* sp.	2	2	0
Ctenocephalides sp. + *Boophilus* sp.	0	7	0
Ctenophalides sp.+ *Rhipicephalus* sp.	3	0	0
Boophilus sp. +*Hyalomma* sp.	1	1	4
Boophilus sp. +*Amblyomma* sp.	1	0	0
Boophilus sp.+ *Muscadomestica*	5	0	0
Hyalomma sp.+ *Rhipicephalus* sp.	0	0	+2
Total	12	11	6

The prevalence of faecal ova/oocysts of ruminants examined in this study are presented in Table 3. An overall prevalence of 70%, 63% and 50% was observed for cattle, sheep and goats respectively. For single infection, a prevalence of 60%, 53% and 47% mixed infection for cattle, sheep and goats respectively. *Strongyle* sp., was the most dominant parasitic ova observed across the three species of animals studied. Other faecal ova/oocyst observed includes *Strongyloides* sp., *Trichuris* sp., *Amphistome sp.*, *Taenia* sp., *Moniezia* sp. and Coccidia (Table 3).

Table 4 shows the prevalence of ectoparasites based on the sex, age and breed of ruminants examined in the study and their predation sites. Female sheep and goats had a significantly higher ($p < 0.05$) infestation than the male unlike in the cattle. Young (1-3 yrs) sheep and goats had a significantly higher infestation than the adult ($p < 0.05$) while in cattle, there was no significant difference between 3-4 yrs and 5-12 yrs aged cattle. There was no significant difference between prevalence rates amongst cattle breeds (Table 4). Yankasa sheep had a higher ectoparasite prevalence of 33.3% than Ouda (31.8 %), and Sokoto red goats had a higher prevalence (27.3%) of ectoparasites than Borno white (20.0%) ($p > 0.05$). Amongst cattle and goats, the tail region was the most infested, while in sheep it was the ear region (Table 4).

Table 3: Prevalence of single infection of Cattle, Sheep and Goats with faecal ova/oocysts

Faecal ova/ Oocysts	**% of ruminants infested (n=100)**		
	Cattle	Sheep	Goats
Single infection			
Strongyle sp.	27	25	27
Strongyloides sp.	18	15	8
Trichuris sp.	0	2	1
Amphistome sp.	1	0	1
Taenia sp.	1	1	3
Moneizia sp.	1	3	0
Coccidia	12	7	7
Total	60	53	47
Mixed infection			
Strongyle sp.+ *Coccidia*	6	5	1
Strongyloides sp. + *Coccidia*	2	2	0
Moneizia sp. + *Coccidia*	1	2	1
Taenia sp. + *Coccidia*	0	0	1
Strongyle sp.+ *Strongyloides* sp.	1	1	0
Total	10	10	3
Overall Total	**70**	**63**	**50**

Table 4: Prevalence of Ectoparasites of ruminants examined based on their sex, age, breed and predilection site

Variables	Cattle		Sheep		Goats	
	No. Examined	No. infested (%)	No. Examined	No. infested (%)	No. Examined	No. infested (%)
Sex						
Male	42	18(42.9)	44	12(27.3)	50	8(16.0)
Female	58	24(41.4)	56	21(35.7)	50	16(32.0)
Total	100	42(42.0)	100	33(33.0)	100	24(24.0)
Age						
1 – 3 yrs	-	-	61	33(54.1)	61	24(39.3)
3 – 4yrs	44	19(41.2)	20	0 (0)	20	-
5 – 12yrs	56	23(42.1)	19	0(0)	19	-
Breeds						
Wadara	94	37(39.4)	-	-	-	-
Kuri	03	3(100)	-	-	-	-
Cross	03	2(66.7)	-	-	-	-
Yankasa	-	-	78	26(33.3)	-	-
Ouda	-	-	22	7(31.8)	-	-
Sokoto Red	-	-	-	-	55	15(27.3)
Borno White	-	-	-	-	45	9 (20.0)
Predilection Site						
Tail region	100	25(25.0)	100	05(5.0)	100	14(14.0)
Ear	100	05(5.0)	100	13(13.0)	100	08 (8.0)
Neck	100	11(11.0)	100	06(6.0)	100	02 (2.0)
Eye	100	01(25.0)	100	-	100	-
Abdomen	100	-	100	09(9.0)	100	-

Finally, Table 5 shows the prevalence of faecal ova/oocysts of ruminants examined based on animal sex, age and breed. Female cattle (74.1%), sheep (73.2%) and goats (58.0%) had a significantly higher ($p < 0.05$) prevalence rate than male cattle (64.3%), sheep (50.0%) and goats (42.0%). Also 3-4 years old cattle (84.1%) and sheep (70.0%) had a higher prevalence than the 1-3 yrs age groups unlike in the goats (50.8%). Yankasa sheep (68.2%) and Borno white (51.1%) goats had a significantly higher prevalence ($p<0.05$) than Ouda (0%) sheep and Sokoto red (49.1%) goats respectively (Table 5).

Table 5: Prevalence of faecal ova/oocysts of ruminants examined based on their sex, age and breed.

Variables	Cattle		Sheep		Goats	
	No. Examined	No. infested (%)	No. Examined	No. infested (%)	No. Examined	No. infested (%)
Overall	100	70(70)	100	63(63)	100	50(50)
Sex						
Male	42	27(64.3)	44	22(50.0)	50	21(42.0)
Female	58	43(74.1)	56	41(73.2)	50	29(58.0)
Total						
Age						
Young						
1 – 3 yrs	-	- (0)	61	49(80.3)	61	31(50.8)
Adults						
3 – 4yrs	44	37(84.1)	20	14(70.0)	20	19(48.7)
5 – 12yrs	56	33(58.9)	19	- (0)	19	- (0)
Breeds						
Wadara	94	64(68.1)			-	- (0)
Kuri	03	03(100)			-	- (0)
Cross	03	03(100)	78	48(61.5)	-	- (0)
Yankasa	-	- (0)	22	15(68.2)	-	- (0)
Ouda	-	- (0)	-	- (0)	-	- (0)
Sokoto Red	-	- (0)	-	-(0)	55	27(49.1)
Borno White	-	- (0)	-	-(0)	45	23(51.1)

Discussion

This study established that ruminants on the University of Maiduguri Animal Farm are afflicted by ectoparasites with a moderate prevalence (<50%). This corroborates with a similar finding in Ethiopia (Tadese *et al*., 2011). Ticks were the most common ectoparasite found infesting livestock in this study. This parasite was observed in parts of the animals such as the ears, neck, eye, tail and the abdomen. This is in agreements with Tongjura *et al*. (2012) and Adang *et al.*, (2015) but in contrast with the results by Obi *et al*. (2014), who reported fleas to be the dominant ectoparasites in both sheep and goats. *Boophilus* sp. was the most prevalent of the ticks in all the animal species found in this study. This agrees with the study by Adang *et al*. (2015) in sheep, but in contrast with the study by Maidala (2015) in goats and Tongjura *et al*. (2012) in cattle, sheep and goats. *Amblyomma* sp.was reported as the most prevalent of the ticks in their respective studies. In this study, *Ctenocephalides* sp. was only seen in sheep but was not found in cattle and goats. Similar observation was made by Adang *et al*., (2015) in sheep but not in goats.

In this study, Cattle 42.0% had higher prevalence of ectoparasites than sheep 33.0% while goats 24.0% had the least. Lower prevalence of ectoparasites in goats has been attributed to some factors such as

better body habit of self grooming, licking, scratching, rubbing and grazing behavior, which could contribute to rapid ectoparasites elimination (Yishak *et al*., 2015). Furthermore, females had higher prevalence of ectoparasitic infestation in cattle and sheep than males. This could be attributed to physiological and other genetic influences (Fakete and Kellems, 2007; Paul *et al*. 2016). Other researchers ascribed this occurrence to the fact that more females are allowed unto open and extensive grazing to promote breeding, thus exposing them to infected communal grazing pastures that favors contact infestations (Regassa *et al*., 2006; Tadese *et al*., 2011; Paul *et al*., 2016). Risk factors such as age, predilection sites or breed shows that higher prevalence rates were obtained for adult animals of Wadara cattle, Yankasa sheep and Sokoto red goats, and the tail region was more infested than other body parts. All these observations enumerated above agree with the observation James- Rugu and Iwuala, (1995) that they are potential risk factors and are significant in the epidemiology of these parasites.

Gastrointestinal helminths such as nematodes, trematodes and cestodes were observed in this study. This corroborates with report from other studies (Biu *et al*., 2009; Paul *et al.*, 2016). Prevalence of faecal ova/ oocysts revealed a significantly higher rate amongst female and 3-4 year old (adult) cattle, sheep and goats than male and young. This differs from the report of Mbaya *et al*. (2009) that older animals tend to acquire immunity through frequent challenge, and expel developing stages even before they establish. However, certain conditions such as pregnancy and parturition in female, nutritional stress and concurrent infection, may compromise immunity and exacerbate parasitism in old ruminants (Fakete and Kellems 2007; Paul *et al*., 2016).There were no breed differences amongst cattle, but Yankasa sheep and Borno white goats had significantly higher faecal ova/oocysts than the Ouda sheep and Sokoto red goats.Variations in breed differences were previously observed by Shimelis *et al.* (2011) and Idika *et al*. (2012), to be due to genetic differences in susceptibility and resistance.

Conclusion and Recommendation

Conclusively, this study has identified the presence of endo and ectoparasites parasitizing ruminants domesticated at the University of Maiduguri farm. They are therefore need for routine deworming using appropriate anthelmintics as well as the use of appropriate acaricides to control these parasites so as to prevent the adverse effect on the animal health. Also, potential risk factors associated with the epidemiology of ruminant parasitism has been identified which forms the foundation to which a control strategy of parasitic conditions can be constructed.

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