

Studies of Ectoparasites Bionomics among Household Animals in Ebonyi State

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Abstract

All over the world, ectoparasites is a serious menace to livestock, as well as human. Their parasitic activities include transmission of pathogenic organisms while feeding on the host tissues, establishment of their parasitic larval stage at the sub-dermal region of the skin, thereby creating a room for invasion of infectious organism. The study of tick's ectoparasites bionomics among household animals in Ebonyi state was conducted in Ebonyi central district in 2019 using standard entomological techniques. A total of 300 animals were examined at different predilection sites and hygiene for ectoparasite bionomics. The result revealed that of the 539 (179.7%) ectoparasite recovered, sheep had the highest prevalence 215 (39.80%) followed by goats 191 (35.40%) and lastly dog 133 (24.66%). There was a mixed infestation among the animals examined of which sheep was infested with 55 (47.83%) ticks, goat 50 (43.48%) and dog 40 (34.78%). These ectoparasites had a high infestation rate in the animals assessed with very poor hygiene and nutritional standard, therefore control and treatment of these infested animals should be taken seriously because of the damage caused on these animals. The study also revealed that most ectoparasites were choice specific in infestation. It is therefore recommended that further research on the occurrence and spread of ectoparasites diseases should be carried out to cover other areas of Ebonyi state.

Keywords: Ectoparasites • Tick • Bionomics • Sheep • Goat • Dog

Introduction

Small ruminants and their products are important export commodities in Nigeria, contributing to the national economy in addition to supporting the livelihood of millions of pastoral people. Owing to their high fertility, short generation interval and adaptation even in harsh environment. Sheep, dog and goats are considered as investment and insurances to provide income to purchase food during seasons of crop failure and to meet seasonal purchases such as improved seed and fertilizers for rural households [1].

Sheep, goat and dogs are the first animals to be domesticated and have continued to provide various functions to man. Special features of sheep, dog and goat which favor their production includes their greater resistance to drought, short production cycle, low unit costs and easy to handling and husbandry [2]. Sheep, dog and goat are multipurpose animals producing meat, milk, skin, wool or hair and manure [3].

Even though small ruminants are important components of Nigeria farming system, productivity is still low and their contribution to food production are far below the expected potential compared to other countries. This is because small ruminant production in Nigeria is constrained by the compound effects of diseases, in adequate nutrition and poor management. Direct and indirect losses occur through mortalities, reduced weight gain, poor reproductive performance and condemnation of diseased organs at the abattoir [4].

Skin from goat, sheep and dogs has important economic products contributing for the largest share of the total and agricultural export commodities. This fact gives the advantage of earning a large foreign currency from the export of hides and skins. About one million hides and nine million skins are processed every year in more than twenty tanneries in different parts of the country [5].

However, about 50% of sheep skins are rejected because of an allergic dermatitis caused by lice and keds, which is characterized by discoloration of the skin or formation of small nodules on the dermis.

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These nodules may rupture and leaves scars when they heal. Both these scars and the discolorations formed due to the allergy do not take dyes during tanning, which cause rejection of the leather products [6].

However, the contribution of sheep, dog and goats to the national income is under the expected potential. This is because external parasites such as mange mites, lice, sheep ked and ticks are the major causes of skin diseases that have resulted in downgrading and rejections of skins [7]. Skin diseases are among the major diseases of small ruminants causing serious economic loss to small holder farmers, the tanning industry and the country as a whole. Skin disease causes decreased production and reproduction and rejection of skins. According to tanneries report, skin disease due to external parasites cause 35% sheep skin and 56% goats skin rejection [8].

Materials and Methods

Study area

The study was conducted at different animal markets, Ezza South local government area, Ezza North and Ishielu local government area, Ebonyi state, South Eastern Nigeria. The areas had annual rainfall of about 866-1200 millimeters respectively. The annual mean minimum and maximum temperature is 18°C to 25°C respectively [9]. The farming system in the area is mixed type (crop-livestock production). The occupation of most of the inhabitants is agriculture with; sheep, dog and goat rearing under the intensive and semi-intensive animal husbandry management systems. Ezza South has an area of 324 km² and a population of 133,625 at the 2006 census. Ezza North is a local government area in Ebonyi state; its headquarters is at Ebiaji town. It has an area of 305 km² and a population of 145,619 at the 2006 census. Ishielu is also a local government area in Ebonyi state. Its headquarters are in the town of Ezillo. It has an area of 872 km² and a population of 151,048 at the 2006 census.

Study animals

The study was conducted on small ruminants and dog (sheep, dog and goats) that were brought to animal markets without veterinary checks taking note of male and female sexes. The animals sampled were from different age groups and classified young and adult. The age determination was made based on owner's information and according to Lehmann. Lambs and kids that were less than 6 months old were considered as 'young' where as those more than 6 months old were included in the 'adult' group.

Study design, sampling and sample size determination

The study was a cross-sectional study in which each animal was examined twice during the study period while those repeatedly brought to the market was intermittently checked. A total of 300 animals (100 dogs, 100 sheep and 100 goats) were examined for the study.

Field studies: The field studies were carried out by assessing the animals for ectoparasite severally and twice per annum for re-infestation. At the same time assessed the various predilection sites where the ectoparasites had previously infested.

Sampling method

The study animals (both male and female) were screened for ectoparasites using standard entomological techniques. The survey was carried out weekly between September and November, 2019 in the animal market.

Physical screening

The physical screening and visual inspection of the head, neck, abdomen, trunk, legs and tail were performed to search for ectoparasites. Forceps were used to pick out ectoparasites from hidden parts of the body.

Hand-picking

With the aid of hand gloves, the ticks were hand-picked by systematically searching the various body regions of the study animals. Ectoparasites obtained from the different animals (dog, goat and sheep) as well as different body regions were kept separately in a labeled collecting vials for identification and counting.

Collection and identification of ectoparasites

During the examination, immature stages were collected and kept in 70% alcohol where identification was done using light stereomicroscope according to the standard taxonomic keys by Wall and Shearer, Soulsby, for lice and Morel for ticks. The body of animal was divided into ear, head, shoulder, back ventral sites, hoof, anus-vulva area and tail. Hard ticks were collected from different predilection sites of the examined animals. Each type was placed in separate Eppendorf tube containing silica gel that had been pre-labeled with date, zone, locality and animal species, sex and body condition. Each tube was tightly closed and transported for further examination in the laboratory, during collection; care was taken to ensure that the mouth parts of tick were not left behind during traction with thumb forceps [10].

Data analysis

Data was generated from the different animals sampled and the ticks from the infested animals were subjected to ANOVA to test for the significant different among sex and the number of animals, and also tested for the infestation rate of the ectoparasites observed [11].

Results

The results show in Tables 1-3.

Infestation rate	Goat	Sheep	Dog	Total (%)
No. of animals infested	50 (43.48)	55 (47.83)	40 (34.78)	115 (38.30)
No. of ticks	191 (35.40)	215 (39.80)	133 (24.60)	539 (179.70)

Table 1. Prevalence of ticks bionomics among animals examined in Ebonyi state.

The ANOVA result showed that there is a high significant difference between ticks at $P < 0.05 = 82$.

Animals	Sex	Ticks		
		Number examined	No. infested	Overall percentage of each animal
Goat	Male	52	30 (57.69)	50%
	Female	48	20 (41.67)	
Sheep	Male	54	35 (64.81)	55%
	Female	46	20 (43.47)	
Dog	Male	53	25 (47.16)	40%
	Female	47	15 (31.91)	

Table 2. Prevalence of ticks in relation to sex of animals.

The ANOVA showed that there is a significant difference between number infested and uninfested male and female animals at $P < 0.05 = 4.0$ and 0.00 respectively.

Livestock	Number fed	Unfed	Engorged	Half gravid	Total
Sheep (100)	53	43	80	39	
Goat (100)	46	35	70	40	
Dog (100)	40	18	50	25	
Total (300)	139	96	200	104	539

Table 3. Morphological stage of the ticks examined.

Table 4 showed the different feeding stages of the livestock. half gravid and fed which may lead to rapid life cycle of the ticks. According to the study carried out, the livestock are more engorged,

Livestock	Ectoparasites Spp. recovered	No. of Ectoparasites recovered	Predilection sites						
			Neck	Ear	Skin	Head	Abdomen	Trunk	Armpit
Sheep	<i>Amblyomma variegatum</i>	39	7	10	5	6	5	2	4
	<i>Dermacentor maginatus</i>	10	2	3	1	2	1	1	0
	<i>Hyalomma rufipes</i>	7	1	3	1	2	0	0	0
	<i>Hyalomma truncun</i>	8	2	3	1	1	0	0	1
	<i>Rhipicephalus sinus</i>	21	4	5	2	5	2	1	2
	<i>Rhipicephalus appendiculatus</i>	36	8	10	4	5	3	3	3
	<i>Rhipicephalus deoloratus</i>	22	3	8	3	4	1	1	2

	<i>Rhipicephalus annulatus</i>	21	4	8	3	4	0	1	1
	<i>Hyalomma dromedarii</i>	9	2	3	2	1	0	0	1
	<i>Rhipicephalus microplus</i>	20	2	6	3	4	1	1	3
	<i>Amblyomma habraeum</i>	16	2	5	2	4	1	0	2
	<i>Hyalomma impressum</i>	6	1	2	1	1	0	0	1
Goat	<i>Amblyomma variegatum</i>	35	5	15	4	7	1	1	2
	<i>Dermacentor marginatus</i>	12	1	3	3	2	1	0	2
	<i>Hyalomma rufipes</i>	10	2	4	1	2	0	0	1
	<i>Hyalomma truncatum</i>	15	2	5	3	4	0	0	1
	<i>Rhipicephalus sinus</i>	25	3	7	4	5	2	1	3
	<i>Rhipicephalus appendiculatus</i>	40	7	18	5	7	1	0	2
	<i>Rhipicephalus deoloratus</i>	14	2	4	2	3	0	1	2
	<i>Hyalomma dromedarii</i>	18	3	6	3	4	1	0	1
	<i>Amblyomma habraeum</i>	22	2	7	2	5	1	2	3
Dog	<i>Dermacentor marginatus</i>	13	2	5	2	2	1	0	1
	<i>Rhipicephalus sinus</i>	28	4	8	5	7	1	1	2
	<i>Ixodide ricinus</i>	10	2	3	2	3	0	0	0
Total	<i>Amblyomma americanum</i>	14	2	5	1	2	2	1	1
	<i>Dermacentor variabilis</i>	11	2	4	2	2	0	0	1
	<i>Ixodes scapularis</i>	15	1	6	1	4	1	1	1
	<i>Rhipicephalus sanguineus</i>	26	3	10	2	7	1	1	2
		539	83	181	72	109	28	20	46

Table 4. Check list of tick's ectoparasite bionomics in Ebonyi state.

Discussion

The studies of ticks ectoparasites bionomics among household animals in Ebonyi state was carried out among three animal species examined with standard entomological techniques. The study revealed that among the 300 animals sampled for the ectoparasites of ticks, 115 (38.30%) were infested with different species of ectoparasites.

The study showed that sheep recorded the highest prevalence 55 (47.83%) with ticks' abundance rate of 215 (39.80%) while goat and dog share relative abundance of 50 and 40 respectively [12].

The prevalence of ectoparasite of ticks in sheep and dogs differs significantly with goat ranking 191 (35.40%) while dog 133 (24.60%), this is because sheep harbors more life cycle stages as a result of high skin attachment and soft lather contained than other animals.

This also could be associated with sheep's ability to adapt to a contaminated environment and accumulate high pathogens which may serve as resource pores for ticks to breed. Locations of this study whereby animals graze in open field un-hygienically cared for and medicinally unattended and un-kept in open pen could be a predisposing factor.

The overall prevalence of 179.7% recorded in this study is higher than that of Kagira and Kanyari who reported a prevalence of 10.0% in sheep and goats in Gwagwalada area of FCT Abuja, Nigeria. The 47.83% prevalence reported in sheep in this study is higher than 13.1% reported by George, et al., in Zaria, Kaduna State, and North Western Nigeria.

Also, the 43.48% prevalence reported in goat in this study is higher than 3.7% reported by George, et al., in Zaria, Nigeria. The study showed a high prevalence of ectoparasite species of ticks in the animal with highest infestation in sheep. The study showed that most of the livestock sold in the animal market at Ezza South, Ezza North and Ishielu local government area were infested with ticks of different species which may lead to reduction in the market value of the animal [13].

The study showed the prevalence of ticks ectoparasite in sheep with male 35 (64.81%) and female 20 (43.47%) respectively. Male sheep were more infested with ticks compared to female while both male and female goat and dog almost shared the same prevalence of ectoparasite species of ticks with male goat 30 (57.69%), female goat 20 (41.67%) and male dog with 25 (47.16%) and female dog 15 (31.19%) Table 3. This study indicates that sheep were more susceptible to ectoparasite infestations than goats. This is in agreement with the reports of Barmon, et al., Amuamata, et al., and Yishak, et al., but contrary to Yakhchali and Hossiene, Onojafe, Mulugeta, et al., and Obi, et al., who reported goats to be more infested than sheep. According to Amuamata, et al., and Yishak, et al., the higher prevalence of ectoparasites in sheep than in goats could be attributed to the better body habit of self-grooming, licking, scratching, rubbing and grazing behavior in goats, which could contribute to rapid ectoparasites elimination. Although, sheep were more infested than goats in terms of prevalence, goats had more ectoparasite species on them than sheep. Goats are browsers, prefer bushes/shrubs, tree leaves and rough browse plants and need more space to roam about freely during browsing, thus could be more exposed to a variety of ectoparasite species [14]. The occurrence of tick's infestations in males than in females agrees with the findings of Yakhchali and Hossiene, Mbuh, et al., and Yishak, et al., who reported that higher level of testosterone makes males more susceptible to infestation. Thus, it could be deduced that some hormonal influence is associated with the higher prevalence of ectoparasitic infestations in males than in females. High infestation of ticks on these animals may lead to serious loss in skin, hide, hair, milk, meat and even manure which helps our crop to grow. The infestation of ticks on those animals is also capable of causing serious bacterial and fungal disease on the animal thereby leading to great losses or even death of the animal and these losses are capable of reducing the market value [15].

The present study reports that young animals were more susceptible to ectoparasites infestations than adults. This finding agrees with the reports of Otesile and Obasaju, Lehmann, Yacob, et al., and Barmon, et al., but contrary to Yakhchali and Hossiene, Obi,

et al., and Yishak et al., who reported higher prevalence in adult animals than young animals. The wool and hair of the young animals is not fully developed to be able to protect them from ectoparasites infestations. Lehmann attributed the greater susceptibility of young animals to ectoparasites infestations to a higher ratio of accessible surface to body volume and poor grooming behaviour.

The checklists of tick's ectoparasites bionomics showed that a total of 539 tick species were collected from different parts of the livestock (sheep, goat and dog) examined. The tick's ectoparasites tend to choose a specific site of attachment on the animal body. The Table 4 above showed the species of ticks found on the animal were based on the number gotten from each species with the predilection sites. The result gotten showed that the ear and head of the animals had more infestation than other parts of the animal showing a total of 181 and 109 ticks respectively. The common species of ticks in sheep and goat with highest prevalence were *Amblyomma variegatum* and *Rhipicephalus appendiculatus* which was found more in the ear and head of the animal examined when compared to other parts of the animal while *Rhipicephalus sinus* and *Rhipicephalus sanguineus* occurs more in dog [16].

The twelve ticks ectoparasite according to Table 4, have been previously reported by other researchers Otesile and Obasaju reported *Damalinea ovis*, *Rhipicephalus* sp., *Amblyomma* sp. and *Ctenocephalides canis*, Ugochukwu and Apeh reported *Damalinea ovis* and *Ctenocephalides canis*, George, et al. reported *Damalinea ovis*, Omudu and Amuta reported *Amblyomma* sp., *Boophilus* sp., *Ctenocephalides* sp., Onojafe reported *Damalinea ovis* and *Rhipicephalus* spp. and Ohaeri and Ugwu reported *Damalinea caprae*, *Rhipicephalus* spp. and *Boophilus annulatus*.

The nine ectoparasite species reported from goats in this study have been reported by previous researchers. Otesile and *Sarcoptes scabiei*, Ugochukwu and Apeh reported *Boophilus decoloratus* and *Amblyomma variegatum*, George, et al. reported *Sarcoptes scabiei*, Omudu and Amuta reported *Amblyomma* sp., *Boophilus* sp., *Hyalomma* sp., *Rhipicephalus* sp., *Ctenocephalides* sp. And *Sarcoptes scabiei*, Onojafe reported *Ctenocephalides* spp. and Ohaeri and Ugwu reported *Damalinea ovis* and *Rhipicephalus* spp.

However, some of the ectoparasites reported by these researchers were not reported in this study. This may be due to differences in the seasons of the study, number of animals examined, agro-climatic zone of the study area, as well as the climatic conditions of the area such as rainfall, temperature, relative humidity, topography and composition of soil type and type of management system [17].

Ticks were the most prevalent ectoparasites in this study. This concurs with the findings of Osman, Yakhchali and Hossiene, Onojafe, Mbuh, et al., Mulugeta et al., Ohaeri and Ugwu and Yishak, et al., but contrary to Obi, et al., who reported fleas to be the dominant ectoparasites in both sheep and goats. Elsaid, et al. reported ticks as the most frequent ectoparasites in sheep and fleas as the most ectoparasites in goats. These findings underscore that advisability of including sheep and goats in acaricide application programmes designed for the control of tick-borne diseases in cattle at the same locality or area [18,19].

The predilection sites of these ectoparasites have been reported by other researchers. *Damalinea caprae* on neck, trunk, hind legs and pelvic of goats and *Ctenocephalides canis* on legs and tail. Yakhchali

and Hossiene reported ticks on the tail, ears and testis of goats and *Damalinea ovis* and *Damalinea caprae* around the neck and back area of sheep. Mbuh, et al., reported genital distribution of ticks on sheep and goats with more ticks concentration around the scrotum of males. Ohaeri and Ugwu reported *Damalinea ovis* on head, neck and trunk of sheep and head and neck of goats, *Rhipicephalus* spp. on head, neck, abdomen, trunk, leg, tail and pelvic of sheep and goats, *Boophilus* sp. On abdomen, trunk and pelvic of sheep. The predilection sites of these ectoparasites are likely areas where capillary blood can be reached easily. The predilection sites for attachment of the ectoparasites on the host might be due to soft leather and high skin attachment in the animal in which the ectoparasites attached to acquired nutrient (blood). And this may be the reason why they chose to be attached more in the ear and head of the animal [20].

Conclusion

From the study, ticks are identified as the major ectoparasites of livestock in animal market at Ezza South, Ezza North and Ishielu local government area in Ebonyi state. These tick ectoparasites had a high infestation rate in the animals examined and such possess a severe economic loss nutrient loss and causes diseases to both the animals and indirectly to man. Therefore, control and prevention or treatment of these ectoparasites should be taken seriously because of the negative impact or damage it has on these livestock. Further study to assess the impact of these parasites on health status of the livestock and on human being should be carried out fast since these ectoparasites also parasitize human mostly those who work in close contact with the animal. And the pen where these animals are kept should be clean and medically checked to reduce the prevalence of these ectoparasites on the animal. It is therefore recommended that further research on the occurrence and spread of ectoparasite diseases should be carried out. Ticks, being a dangerous ectoparasite which affects both livestock and humans should be properly controlled and treated or prevented by using both physical and chemical means. The physical means include manual removal of attached ticks and environmental modification to reduce the suitability of the habitat to ticks while chemical treatment and prevention include products for use on companion animals and products for use in the environment.

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