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Bovine Trypanosomiasis And Tsetse Fly Survey In Some Parts Of Kaduna State, North Western Nigeria.

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Abstract: *This survey on trypanosomiasis and tsetse fly was conducted between January and February 2016 in 6 communities from 5 LGA of Kaduna State, with the ultimate objective of forwarding baseline information on the extent of the problem and towards providing control strategies. Tsetse survey was done by deploying biconical traps to the drinking and grazing sites of the cattle and parasitological survey was done by aseptically collecting blood samples from cattle through the jugular vein and screened using Buffy coat technique. In addition, the Packed Cell Volume (PCV) of the animals was taken. A total of 352 cattle were screened, out of which 3.98% prevalence rate of trypanosomiasis was detected. The dominant trypanosome species encountered was T. congolense constituting 78.57% of the total trypanosome infection, where as 21.43% of the trypanosome infection was caused by T. brucei. Total number of tsetse flies caught within 24 hours of deployment of biconical traps was recorded as 45 (in Pantaki and Maganda areas of Kagarko LGA). Glossina palpalis palpalis was the only species of fly tsetse caught with mean apparent density of 4.92. Mean PCV of the 352 cattle were recorded as 25.18% with 131 having PCV < 25% (anaemic) and 221 with PCV ≥ 25%.*

Keywords: *Cattle, Trypanosomiasis, Glossina palpalis palpalis, Trypanosoma brucei, Trypanosoma congolense, Biconical trap, Tsetse fly, PCV.*

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I. Introduction

Tsetse flies are cyclic vectors of trypanosomiasis, a disease found mostly in rural areas disturbing agro-pastoral activities. The situation results in insufficient production of local food due and livestock-keeping [1]. About 10 million km^2 areas of the 37 sub-Saharan African countries are infested with tsetse flies [2].

Tsetse flies cause a serious damage in the areas that can least afford treatment and threat is not limited to humans. African animal trypanosomiasis or Nagana is caused by the parasites *Trypanosoma congolense, Trypanosoma vivax* and *Trypanosoma brucei bruice* all of which are transmitted by the tsetse fly [3].

Animal trypanosomiasis is one of the key constraints in the progress of animal production in Sub-saharan Africa [4, 5], and effects yearly losses calculated as 1 billion US dollars [6]. In Nigeria, tsetse flies still infest 80% of the nations land mass as well as the high lands of Jos, Mambilla, and Obudu plateau previously known to be free from tsetse [7].

The Nigerian Institute for Trypanosomiasis Research (NITR) has received information of outbreaks of animal trypanosomiasis which caused deaths of cattle some time back resulting in animal migration of semi-nomadic Fulani out of Lere local government areas in the rainy season. Lere LGA used to be a recognized human African trypanosomiasis (sleeping sickness) endemic center between 1930 and 1960 [8].

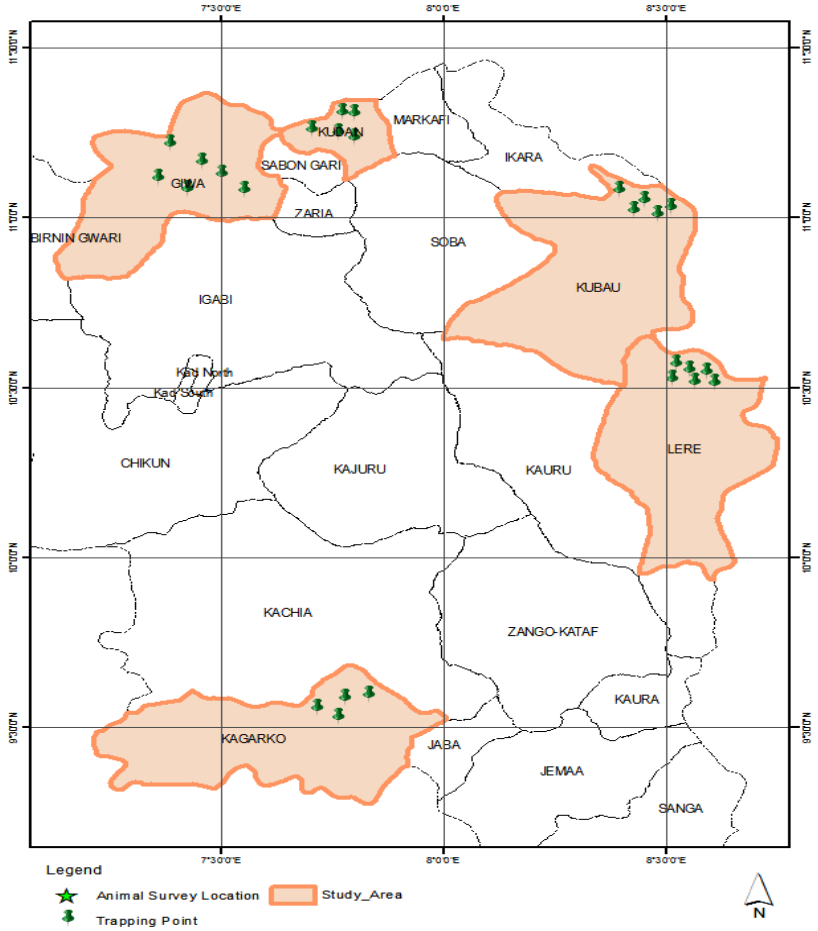
Livestock contribute a great proportion of earnings for a number of countries in Africa. Tsetse transmitted trypanosomiasis continues to be the major limitation of livestock production in Sub-Saharan Africa, jeopardizing the lives of 55 million cattle. The risk of infection in human as well as in animals has been known to seriously affect socio-economic and agricultural development of communities in the infested areas [9, 10].

It is estimated that, Africa looses over 3 million cattle and other domestic livestock through deaths caused by trypanosomiasis annually [11].

II. Materials and Methods

2.1 Study area

The study was conducted in the grazing fields of 6 communities in 5 local government areas (L.G.A) of Kaduna state; Madara in Giwa LGA, Kushigi in Kudan LGA, Bitarana in Lere LGA, Ruwan sanyi in Kubau LGA, Pantaki and Maganda in Kagarko LGA.



The map of Kaduna state showing the 5 LGAs where the survey was conducted.

2.2 Tsetse survey

The Tsetse fly survey was conducted by the used biconical traps [12]. The traps were deployed at altitude range of 683.15 above sea level and were left for approximately 24hrs. Each trap position was geo-referenced using GPS (Garmin GPSMAP 76CSX).

The traps were then harvested and cages with tsetse flies caught were stored in a cool box for proper handling and transportation to the institute. The flies were then identified, sexed, counted and recorded. The tsetse flies caught were then preserved in RNAlater solution for future molecular analysis [13].

2.3 Trypanosome Survey

A systematic random sampling was used to obtain blood sample of 352 cattle of different ages, sexes and breed. The animals were made up mostly of white Fulani breeds of cattle (Bunaji) and a few Sokoto Gudali.

From each animal, about 2 milliliters of blood were taken from the jugular vein and then dispensed into specimen bottles containing ethylene diamine tetra acetic acid (EDTA) and taken to the field laboratory for analysis. The samples were collected into heparanised capillary tubes up to 3/4 of the length and sealed with plastacil. The blood samples collected were centrifuged for about five minutes with 10,000rpm in a haematocrit centrifuge. The packed cell volume was estimated using haematocrit capillary reader. PCV values <25% were considered anaemic [14].

Blood smear was done via cutting of the spun capillary tubes 1mm above or below the buffy coat region using a diamond tipped pencil. The blood was then expressed on to a clean glass slide mixed well and covered with a clean cover slip. Examination was made using microscope with 10x objective lens and 40x eye piece magnification using dark ground buffy coat technique [14].

The blood samples collected were then stored in a cool box and transported to the institute. Each blood sample was spotted on a Whattman® filter paper and stored in a plastic container containing silica gel for preservation against future molecular analysis. Blood samples in EDTA containers were also preserved at -4°C in the institute's molecular laboratory.

III. Results

3.1 Trypanosome Survey

Trypanosomes were detected in 14(3.98%) out of the 352 cattle, severed *Trypanosoma congolense* was the dominant species encountered, consisting 78.57% of the total trypanosome infections recorded, whereas 21.43% of the trypanosome infections was caused by *T. brucei.* Highest trypanosome infection was seen in Ruwan sanyi with 9.88% followed by Pantaki with 8.96% of the infections.

Table 1: Prevalence of *trypanosomiasis* in six communities within 5 LGAs parts of Kaduna state, north western Nigeria.

S/No	Sampled Locations	No of animals Sampled	Trypanosome encountered *T. congolense*	*T. brucei*	Total No of Positive	Prevalence (%)
1	Madara	29	-	-	-	0%
2	Kushigi	53	-	-	-	0%
3	Bitarana	61	-	-	-	0%
4	Ruwan sanyi	81	5	3	8	9.88%
5	Pantaki	67	6	-	6	8.96%
6	Maganda	61	-	-	-	0%
	Total	352	11	3	14	9.41%

3.2 Packed cell volume (PCV) Values

The overall mean PCV was recorded as 28.50% with a range of 16-45%. Significantly, proportion of parasitaemic animals were anaemic (92.85%) indicating that anaemia was the important clinical indication of trypanosomes infection. 131 cattle had a PCV <25% and 221 cattle had PCV ≥25%.

Table 2: Packed cell volume of sample examined for trypanosome infection at the 6 villages.

S/No	Sampled Locations	No of cattle Sampled	Mean PCV (%)	No cattle PCV ≥ 25%	No cattle PCV < 25%
1	Madara	29	23.27	12	17
2	Kushigi	53	26.84	39	14
3	Bitarana	61	31.34	58	3
4	Ruwan sanyi	81	26.50	44	37
5	Pantaki	67	26.14	34	33
6	Maganda	61	25.18	34	27
Total		352	28.50	221	131

3.3 Tsetse Survey

In the six communities visited for this survey; (Madara in Giwa, Kushigi in Kudan, Ruwan sanyi in Kubau, Bitarana in Lere, Maganda and Pantaki in Kagarko) Tsetse flies were caught only in Maganda and Pantaki Kagarko. A total of 45 tsetse flies were caught in the two communities in Kagarko local government. These flies were separated morphologically according to sexes; 21 males and 24 females, identified as *Glossina palpalis palpalis.*

Male *G. p. palpalis* represented (46.67%) whereas female (53.33%) of the total flies caught respectively.

Table 3: Summary of flies caught in the 6 communities

No. of Traps	Location (River name)	Vegetation	*G. p. palpalis* Male	Female	Total	Tsetse Apparent Density
6	Madara	NGS	-	-	-	-
5	Kal'ana	NGS	-	-	-	-
5	Ruwan sanyi	NGS	-	-	-	-
6	Bakwasa	NGS	-	-	-	-
5	Pantaki	GS	18	22	40	8
4	Maganda	GS	3	2	5	1.25
Total			21	24	45	9.25

Mean apparent density	4.625

Key: NGS stand for northern guinea savanna, GS for guinea savanna.

IV. Discussion

Overall mean PCV of cattle sampled was 28.50% with a range 16-45%. The results showed the mean PCV of cattle is <25% in locations where trypanosome parasites were encountered (Ruwan sanyi and Pantaki) is greater than mean PCV of the cattle <25% in rest of the 4 locations mark the animals anaemic. This is showed significant proportion of parasitaemic animals were anaemic (92.85%) indicating that anaemia was being the important clinical indication of trypanosomes infection. Amongst the 352 cattle, 131 cattle had a PCV < 25% and 221 cattle had PCV ≥25%. Although anaemia could also be due to malnutrition of the cattle in some areas (less access to good grazing site due to the time of survey or deficiency of some vital vitamin) which some healthy cattle had shown PCV <25%. And high PCV also could be due to recent infection in the cattle.

Parasites were detected in 14 out of the 352 cattle, which is 3.98% prevalence rate that is almost in accordance with 4.3% prevalence rate of trypanosomiasis in cattle (EEC-trypanosomiasis control project, 1989-1991). Rate of infection also could have been minimized due to the activities of quacks or self activities by the Fulani occasionally to treat their animals or even the mode of diagnosis (microscopy) of the blood sample which is not entirely efficient or reliable. With respect to this, blood samples collected have been appropriately stored for molecular evaluation of the infection rate of trypanosomiasis in the sample.

T. congolense was the dominant trypanosome species encountered, constituting 78.57% of the total trypanosome infection, where as 21.43% of the trypanosome infection was caused by *T. brucei*. The percentage of trypanosome infection seen in Ruwan sanyi and Pantaki were 57.14% and 42.86% respectively.

This present study shows prevalence of *Glossina* infestation in Kagarko LGA which is an economically important area due to farming activities recording the highest catch of tsetse flies (99.9%) amongst the six locations. This may be due to favorable conditions such as temperature, relative humidity, vegetation and/or abundant animals in the area. All 45 flies caught were identified as *Glossina palpalis palpalis* which show dominance of this species of fly in the survey areas.

Male and female *G. P palpalis* represented (43.75%) and (50%) of the total tsetse flies caught respectively. whereas other flies represented (6.25 %) of the total flies caught. Control strategy had been narrowed since there is a target species which is the only species found. With large number of female flies in the population sterile insect technique can be a stable method of eradication of tsetse flies in these areas. The number of flies caught, have not been much due to unfavorable weather condition during the survey or limited duration of traps in field.

The presence of flies and absence of trypanosome parasite due to the low infection rate associated with palpalis group of flies. Infection rate or presence of trypanosome parasite and absence of flies in a particular location experienced in this survey could be due to migration of the animals and maintenance of infection by other biting flies.

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