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RESULT OF 2004 EXTENDED TRYPANOSOMOSIS SURVEY OF RUMINANTS AT KACHIA GRAZING RESERVE, NORTH CENTRAL NIGERIA

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Running Title: Ruminant Trypanosomosis Prevalence in Nigeria

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ABSTRACT

Tsetse fly and trypanosome prevalence in ruminants were estimated in April and August, peak months of the dry and rainy seasons in the Kachia Grazing Reserve (KGR) of Kaduna State, North Central Nigeria. This study was subsequent to reports of seasonal outmigration of semi nomadic Fulani from the grazing reserve due to death of cattle from trypanosomosis. Result of blood samples showed an overall parasitological infection rate of 17.4%. Infection rates in cattle, sheep and goats were, 18.6%, 9.5% and 5.1% respectively. Over all higher infection rate in the rainy season was attributed to abundance of tsetse and other hematophagus flies. Infection rate in younger animals (21.9%) was higher compared to those of older animals (16.5%). *Trypanosoma vivax* was the dominant infecting trypanosome specie followed by *T. congolense* and *T. brucei*.

It was concluded that tsetse fly and trypanosomosis constituted dual plagues limiting economic livestock production and settling of the pastoralists in the grazing reserve. This warrants application of sustainable integrated control measures to enhance utilization of abundant fodder at the reserve.

Key words: Kachia grazing reserve, trypanosomosis, ruminants, infection rates, Nigeria.

RÉSULTAT DE L'ENQUÊTE DE TRYPANOSOMOSE EXTENSION DE 2004 DES RUMINANTS À LA RÉSERVE DE PISCINE KACHIA, NIGERIA CENTRALE DU NORD

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ABSTRAIT
La prévalence de la mouche tsé-tsé et du trypanosome chez les ruminants a été estimée en avril et août, les mois de pointe des saisons secanes et pluvieuses dans la réserve de pâturage de Kachia (KGR) de l'État de Kaduna, dans le nord du centre du Nigeria. Cette étude a été postérieure à des rapports d'émigration saisonnière de Fulani semi-nomades provenant de la réserve de pâturage en raison de la mort de bovins de la trypanosomose. Le résultat des échantillons de sang a montré un taux global d'infection parasitaire de 17,4%. Les taux d'infection chez les bovins, les ovins et les chèvres étaient respectivement de 18,6%, 9,5% et 5,1%. Le taux d'infection plus élevé pendant la saison des pluies a été attribué à l'abondance de mouches tsé-tsé et d'autres mouches hématophobes. Le taux d'infection chez les animaux plus jeunes (21,9%) était plus élevé par rapport à ceux des animaux plus âgés (16,5%).

Trypanosoma vivax était le trypanosome infectant dominant suivi de T. congolense et T. brucei.

On a conclu que la mouche tsé-tsé et la trypanosomose constituaient des fléaux doubles limitant la production d'élevage économique et la colonisation des pasteurs dans la réserve de pâturage. Cela justifie l'application de mesures de contrôle intégrées durables pour améliorer l'utilisation de fourrages abondants dans la réserve.

Mots clés: réserve de pâturage de Kachia, trypanosomose, ruminants, taux d'infection, Nigeria.

INTRODUCTION

Tsetse flies and Animal African trypanosomosis constitute major threats to livestock value chains and food security with resultant underdevelopment in several parts of sub-Saharan Africa including Nigeria, in spite of decades of attempts at chemotherapeutic and vector control (1 , 2). In Nigeria, tsetse flies had been shown to infest about 80% of the nation's agro ecological land mass including the high lands of Jos, Mambilla and Obudu plateau, previously known to be tsetse free (3). Impact of the disease arise from not less than 3 million livestock deaths in Africa each year and reduced calving rate, livestock numbers, milk off –take, meat off take, animal draft power and mixed farming (1 , 4). Conflict among farmers and pastoralists induced by freshwater scarcity (5) has strengthened the need for development of Nigeria's grazing reserves as panacea. The Nigerian Institute for Trypanosomiasis Research had over the years received reports of outbreaks of animal trypanosomosis in southern parts of Kaduna State (6) with resultant deaths of cattle and migration of semi nomadic Fulani out of the area. For this reason an extended survey was undertaken in the Kachia Grazing Reserve, located within this area, to assess the status of trypanosome infection in ruminants in the grazing reserve for application of appropriate control measures that will permit the settling of more herds in this area and exploitation of the abundant fodder for large scale livestock production. This study was undertaken in 2004 but could not be published due to problems initially encountered in the retrieval of data from storage systems. Even though many works have since been done in this reserve, the data is here presented for the purpose of referencing.

MATERIALS AND METHODS

2.1 Study Area

The Kachia (Ladduga) Grazing Reserve (KGR) is situated at Latitude 10°03′ and10°13′N and Longitude 7°55′ and 8°06′E within the Northern Guinea savanna (Fig. 1) and spans an area of 88,411 hectares, forming parts of Kufana , Kachia and Kamuru Ikulu lands in Chikun, Kachia and Zangon Kataf Local Government Areas respectively in Kaduna State, North Central Nigeria. The Grazing Reserve is divided into six blocks each comprising of an earth dam (Fig. 2) used for the watering of animals. The reserve is inhabited by settled semi nomadic Fulani who apart from cultivation of crops like maize, guinea corn, millet, yams, cocoa yam, groundnuts and cassava, keep cattle, sheep and goats. The Reserve comprised also of nomadic primary and secondary schools, a market, veterinary clinic and health center at the central area of the Reserve. The animals settle here in most part of the year and migrate out to neighboring states following the drying up of the dams and streams at the onset of the dry season which begins in October.

FIG. 1: VEGETATION MAP OF NIGERIA SHOWING THE KACHIA GRAZING RESERVE (ARROWED) IN THE WOODLAND AND TALL GRASS SAVANNAH

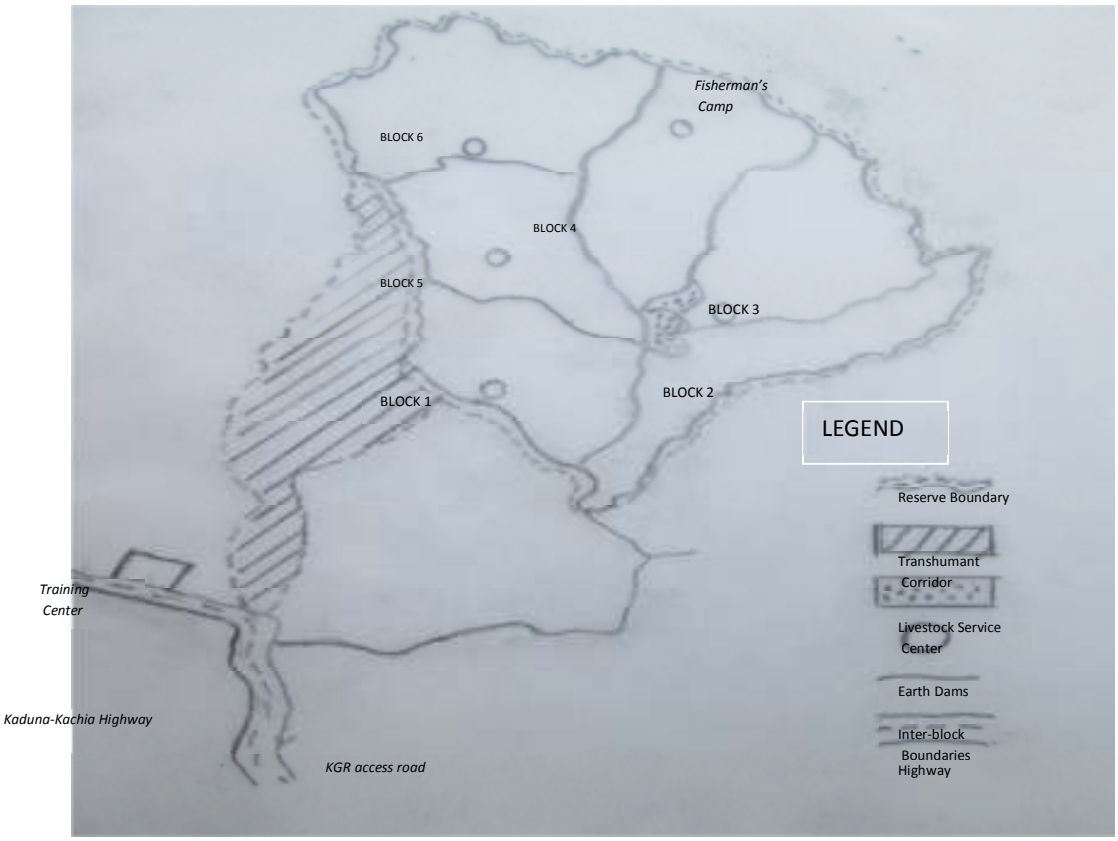

FIG. 2: MAP OF KACHIA GRAZING RESERVE SHOWING GRAZING BLOCKS SAMPLED AND THEIR EARTH DAMS

Animal Sampling

A systematic random sampling of all animals was used to obtain a sample size of 1,641 animals from all blocks made up of 1445 cattle, 137 sheep and 59 goats. Cattle of one year and below were considered young calves whereas those over one year old were regarded as adults while sheep and goats under 5 months were regarded as young and those above 5 months old as adults. The cattle were made up mostly of White Fulani (Bunaji) breed while those of sheep and goats were those of the Yankasa and Red Sokoto breeds respectively. From each of the animals, 5 milliliters of jugular blood were obtained into specimen bottles containing ethylene diamine tetra acetic acid (EDTA) dispensed as one milligram powder per milliliter of blood and conveyed in cold boxes with ice packs to the field laboratory for analysis. The samples were analyzed using buffy coat dark ground/ phase contrast technique (7) and Giemsa-stained thin smears. Trypanosome species were identified based on their morphological structures from Giemsa-stained thin films. Consent was sought from the Kaduna State Ministry of Agriculture and Natural Resources, Chairman of Kachia Local Government as well as the herd owners and their chiefs before the animals were sampled. All parasitological positive cases were treated the following day with Diaminazene aceturate (Berenil) at the dose of 3.5mg /Kg body weight. The study covered the months of April and August which were peak periods of the dry and wet seasons respectively.

Statistical analysis

The data analysis was done using Microsoft Excel 2010. Values between infected and uninfected animals were compared using student t – test. Values between the infected ruminant species were compared using one way Analysis of Variance (ANOVA). In all cases values of $P<0.05$ were considered significant.

RESULTS

The trypanosome infection rates in all ruminants sampled from the Kachia Grazing Reserve is summarized on Table I. The overall infection rate in ruminants was 17.4%. Higher infection rate of 18.9% was observed in the rainy season as against 15.7% in the dry season. This was the general pattern in all ruminant species sampled. Infection rate of 18.6% ($P<0.05$) in cattle was highest followed by 9.5% and 5.1% in sheep and goats respectively. Infection rate in young animals (21.9%,Table II) was higher compared to that of adult animals (16.5%). Infection rate in females (17.8%) was similarly higher than that in males (16.0%, Table III). Of the total number of parasitological positive infections, 94.3% was due to single infections while 5.8% was due to mixed infection. Infections due to *T. vivax, T. congolense, T. brucei* were 44.6%, 37.8% and 0.5% respectively. Of the mixed infection cases, 30.8% was due to *T. brucei* and *T. congolense*, 38.5% due to *T. vivax* and *T. brucei*, and 30.8% due to *T. vivax and T. congolence* mixed infections. Ruminant population encountered in the rainy season was more than those observed in the dry season as many herds migrated out of the Reserve in search of water as most of the dams and seasonal streams had dried up at the peak of the dry season between the months of March and April.

TABLE I: TRYPANOSOME INFECTION RATES IN RUMINANT SPECIES AT THE KACHIA GRAZING RESERVE.

Ruminant Species	Season	No. Animals	No. Positive	Infection Rate(%)
Cattle	Dry	682	116	17.0
	Rainy	763	`153	20.1
		(1445)	(269)	18.6
Sheep	Dry	34	2	5.9
	Rainy	103	11	10.7
	`	(137)	(13)	9.5
Goats	Dry	36	0	0.0
	Rainy	23	3	13.0
		(59)	(3)	5.1
Total	Dry	752	118	15.7
	Rainy	889	167	18.9
		(1641)	(285)	17.4

TABLE II: AGE DEPENDENT TRYPANOSOME INFECTION RATES AMONG RUMINANT SPECIES AT KACHIA GRAZING RESERVE

Ruminant Species	Age	No. Animals	No. Positive	Infection Rate (%)
Cattle	Adult	1173	208	17.7
	Young	272	61	22.4
Sheep	Adult	137	13	9.5
	Young	0	0	0.0
Goats	Adult	52	3	5.8
	Young	7	0	0.0
Total	Adult	1362	224	16.5
	Young	279	61	21.9

TABLE III: SEX DEPENDENT TRYPANOSOME INFECTION RATES AMONG RUMINANT SPECIES AT KACHIA GRAZING RESERVE

Ruminant Species	Sex	No. Animals	No. Positive	Infection Rate (%)
Cattle	Male	409	68	16.8
	Female	1036	201	19.4
Sheep	Male	38	5	13.2
	Female	99	8	8.1
Goats	Male	17	1	5.9
	Female	42	0	0.0
Total No.	Male	464	74	16.0
	Female	1177	209	17.8

DISCUSSION

This study showed that tsetse and animal trypanosomosis were prevalent in the Kachia Grazing Reserve. The overall trypanosome infection rate of 17.4% in ruminants was by far higher than the 4.3% over all prevalence rate for Nigeria obtained from the country wide survey by EEC-Trypanosomiasis control project between 1980- 1996 (3). This suggests that trypanosomosis was a major problem in the grazing reserve. Higher infection rate recorded in cattle than in small ruminants suggests the preference of tsetse and other biting flies for bovine blood than those of small ruminants or the larger size of moving cattle attracted more biting flies compared to small ruminants which are smaller in size. Differences in the infection rates in sheep and goats suggest that husbandry practice played roles in trypanosomosis risk in small ruminants. Whereas sheep were taken along with cattle for grazing, goats were tired around hamlets during the dry and rainy seasons thereby leading to more exposure of the sheep to infection than goats.

Higher infection rates were observed in the rainy season compared to dry season suggesting that this was associated with concurrent increase in tsetse infestation and that of other biting flies at the reserve there by making the risk of trypanosomosis higher in the rainy season. The role of rainy season in abundance of tsetse and other biting flies in trypanosomosis outbreak in livestock in Kaduna State had been described by Maikaje (8). Further analysis of the result showed that trypanosome infection of goats occurred only in the rainy season suggesting that there was encroachment of tsetse on settlement areas which also exposed humans to tsetse bites and trypanosomiasis (sleeping sickness). Kaduna State previously known to be an endemic focus for the human disease was controlled to below endemic proportions (9, 10). Although there had been general resurgence in sleeping sickness in parts of the country (11), the true situation in Kaduna State is not known. Trypanosome infection rate at the grazing reserve was also higher in young animals which suggests that these were current infections acquired probably from the Grazing Reserve with consequent effects on rearing of livestock in the reserve. This may have resulted in reduced herd sizes from death of young animals, growth retardation and infertility in the older animals (1).

The dominance of *T. vivax* infection in the Grazing Reserve may equally have been as a result of prevalent infestation of the area by other biting flies beside tsetse as these have been associated with prevalence of *T. vivax* in the absence of tsetse flies and spread of African trypanosomes beyond tsetse belts of Africa and parts of Asia and Latin America (12, 13).

CONCLUSION

Trypanosomosis was prevalent in Kachia Grazing Reserve and constituted a major threat to economic

production of livestock in the area with higher infection rates in the rainy season, young and female animals. This called for strategic and integrated seasonal approaches to tsetse and other hemophagus flies as well as trypanosomosis control in order to limit the impact of the disease and enhance the settling of more pastoralists in the grazing reserve. Integrated seasonal approach to tsetse fly control means the application of different tsetse fly control techniques which include use of insecticide impregnated screens, epicutenous application of insecticides and Sterile Insect Technique depending on patterns of tsetse fly distribution which varies between dry and wet seasons. This will help limit the conflicts among farmers and pastoralists in this part of Kaduna state and other parts of the country. At the time of this study there was no sustainable tsetse fly control programme in the grazing reserve and the herdsmen migrated out of the reserve seasonally.

CONFLICT OF INTEREST

The authors declare that there was no conflict of interest in the course of this investigation.

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