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EFFECT OF EXPERIMENTAL LIVER FLUKE (*Fasciola gigantica*) INFECTION ON LIVE WEIGHT CHANGES AND GROSS PATHOLOGY OF SAVANNAH BROWN GOATS RAISED UNDER SEMI-INTENSIVE SYSTEM.

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Abstract
The aim of this study was to determine the effect of experimental *Fasciola gigantica* infection on live weight changes and possible gross pathological lesions in Savannah Brown goats raised semi-intensively. Fifteen Savanna Brown goats were used for this experiment and the experimental design was Randomised Complete Block Design (RCBD). Two weeks pre-infection data was collected, and they were randomly assigned to three treatment groups with treatment 1 (infected animals without supplementation) and treatment 2 (infected with supplementation) and treatment 3 (control), respectively. The infected animals were each given 300 metacercariae orally, and all the animals were allowed to graze on natural pasture for about five (5) hours daily while they were fed with beans husk as supplement and fresh clean water was also provided *adlibitum* throughout the experiment. Significant differences ($P<0.05$) were observed in the live weight of the infected groups as from week 8 to week 12 post-infection when compared to the respective values of the controls. The mean live weights of the infected groups from week 8 to week 12 were; T1 (6.5±5.5, 6.1±5.1, 5.8±5.1, 4.5±5.5 and 4.3±5.3), T2 (10.43±1.80, 9.8±5.0, 7.9±5.0, 7.4±4.5 and 4.8±5.5) compared to those for the control group (16.0±4.7, 16.0±4.7, 16.0±4.7, 17.0±4.7, 17.0±4.7). The gross pathological lesions observed in dead goat from the infected group without supplementation was distended gall bladder, haemorrhagic liver as well as areas of necrosis. It was therefore, recommended that supplementary feeding during dry season periods of the year be practiced by livestock farmers within the study area in order to minimize the effect of disease conditions among ruminant livestock.

Keywords: *Fasciola gigantica*, Experimental infection, gross pathological lesions.

Introduction

Goat production is a specialized business since its operation requires some skills like good feeding, proper health and housing management, a deviation from which may lead to a variety of problems such as disease outbreak, parasitic infestation and poor output (Lasisi, 2010).

The population of goats in Nigeria numbered about 35 million (Adebowale, 2012), but the quantity of meat derived from these animals is below demand and this is partly due to the effects of parasitic diseases, such as helminthosis which causes a major health problem that lead to unprofitable production of small ruminants in the country.

A significant proportion of our ruminant livestock in Nigeria and in the tropics are reared under transhumance system with supplementary feeding, resulting in low productivity and high pre-weaning mortality (Adama *et al.*, 2011). Similarly acute shortage of feeds during the dry season remains a common occurrence, this compel these animals to graze in areas that are often heavily infested with the potential intermediate hosts of liver fluke (Traor, 1986; Adama *et al*; 2011), leading to disease outbreak such as fasciolosis caused by *Fasciola gigantica*.

Studies across the country have shown that helminthosis are known to be widespread in Nigeria (Biu *et al*., 2009, Jatau, 2011) and that helminth parasites are by far the most serious causes of production losses in farm ruminants and that they are indisputably the cause of serious production losses to ruminants in Sub-Saharan Africa and worldwide (Ng'ang'a *et al.* 2004; Rahamn, 2004). This experiment is therefore designed to determine the live weight changes and gross pathological lesions observed in *Fasciola gigantica* infected Savanna Brown goats under semi-intensive of management system.

Materials and Methods

Study Area

This study was carried out at the Research farm of the Department of Animal Production, Federal University of Technology, Minna in Bosso Local Government Area of Niger State located in Southern Guinea Savanna zone of Nigeria. Minna has a land mass of 28.55sq. Km, and lies between longitude 6°29^0 of north, the average temperature range is between 18 to 39°C with an average monthly rainfall of 1200mm (NSADP, 1995).

Source of Experimental Animals and Feed

Fifteen (15) Savannah Brown goats of mixed sex, aged between 6 months to1 year old and weighing between 7 -10kg were obtained in Beji market, Bosso Local Government Area of Niger State. Similarly, the feed supplement, 1,000grams of Beans Husk (*Vigna sinensis*) was also purchased in the market.

Pre-infection Management

The animals used for the experiment were properly screened against parasitic infections and other blood parasites through the use of Ivomec injection at 0.5ml/10kg subcutaneously, and long acting Terrancycin injection (TLA) at 1ml/10kg body weight through deep intramuscular muscle. After the treatment, they were further screened to ensure that they were free of any possible infection. Two weeks pre-infection live weights were obtained in this regard.

Experimental Animals

The experiment was arranged in Randomized Complete Block Design (RCBD). Fifteen Savannah Brown goats were used in the experiment. The animals in two groups were each given 500g of beans husk daily for 3 months while the control group was not given any supplement, water was given *adlibitum* after grazing for the day. There was equal representation of the different ages and sex in the three groups. Baseline pre-infection data were collected and the goats were randomly assigned to three treatment groups.

Infective Materials

Viable *Fasciola gigantica* metacercariae were obtained from the Department of Parasitology Laboratory, Faculty of Veterinary Medicine, A.B.U Zaria. They were packed in ice bag and later stored at 4°C in the refrigerator to ascertain their viability till the day of usage.

Animal Infection

The fifteen (15) animals were randomly divided into three groups of five animals each, representing infected with supplement (T_1), infected without supplement (T_2) and control with supplement (T_3). Each of the animals in the infected group was inoculated orally with 300 *Fasciola gigantica* metacercariae according to the procedure described by Adama *et al.* (2011).The experiment is such that all the infected animals were treated after the experiment inorder not to bridge ethical values.

Management of Experimental Animals

All animals were managed under semi-intensive system. Animals were let out to graze freely on natural graze land between 8:00 am to 3:00 pm and they were returned back to their pen and provided feed supplement, bean husks and clean fresh water was also given. The entire study lasted for twelve (12) weeks.

Data Collection

Live weight changes were monitored weekly for a period of ten (10) weeks after (2) weeks pre-infection monitoring using a weighing scale, manufactured from Hana Company with T number 005567. Gross pathological lesions were also monitored in some infected animals through pictorial views.

Data Analysis

The data collected were subjected to Analysis of Variance (Anova) using statistical package (SAS, 2008). Means were separated by the least significant Difference method (Steel and Torrie, 1980).

Results and Discussion

The result of the weight changes observed in the experiment are presented in Table 1 which indicates that there was no significant difference ($P>0.05$) in the body weight changes up to a period of seven (7) weeks. However, significant differences were obtained from week 8 to 12 between the infected treatment without supplement (T_1) and the infected treatment with supplement (T_2) as well as the controls respectively. From 8 -12th week of the experimental period, the weight changes obtained in the control group differs significantly ($P<0.05$) from those of (T_1) and (T_2) respectively. Similarly, during the same period the weight changes obtained in (T_1) differs significantly from 8 to 11th week of the experiment with no significant ($P>0.05$) difference observed at the 12th week of the experiment between the two treatments.

Table 1: Mean body weight of Savanna Brown goats infected with 300 *Fasciola gigantica* metacercariae with or without supplementation with beans husks (Corps pod).

Weeks	T_1	T_2	T_3	SEM	LS
1	10.8±3.6	11.0±1.8	12.0±4.7	1.0	NS
2	10.8±3.6	11.0±1.8	12.0±4.7	1.0	NS
3	10.8±3.6	10.0±1.8	13.0±4.7	1.1	NS
4	10.8±3.6	10.0±1.8	13.0±4.7	1.1	NS
5	11.3±4.1	11.45±2.4	14.0±4.7	1.2	NS
6	11.0±3.9	11.44±2.6	14.0±4.7	1.2	NS
7	11.0±3.9	11.32±2.6	15.0±4.7	1.3	NS
8	$6.5±5.5^b$	$10.43±1.80^{bc}$	$16±4.7^a$	1.4	*
9	$6.1±5.1^b$	$9.8±5.0^{bc}$	$16.0±4.7^a$	1.7	*
10	$5.8±5.1^b$	$7.9±5.0^{bc}$	$16.0±4.7^a$	1.8	*
11	$4.5±5.5^b$	$7.4±4.5^{bc}$	$17.0±4.7^a$	2.0	*
12	$4.3±5.3^b$	$4.8±5.5^b$	$17.0±4.7^a$	2.0	*

T_1 =infected without supplement, T_2 = Infected with supplement, T3 = Control,
abc = means on the same row with different superscript are significantly different(P<0.05).
NS = No significant difference (P>0.05), L_S = level of significance, Sem = Standard error of mean

The gross pathological lesions of the liver of a goat in the infected group without supplement (T_1), shows a distended gall bladder with haemorrhagic liver (plate1). A further opening up of the same liver (plate11) shows gross pathological lesions of haemorrhages and areas of necrosis.

A picture of a *Fasciola gigantica* infected goats in infected group without Supplement (T_1) at week 7 post infection is shown in plate III. Similarly recovered immatured worms from the liver of a goat without supplementation (T_1) is shown in plate IV.

The significant (P<0.05) weight losses recorded in this study from the two infected groups(T1 and T2) when compared to the control (T3) as from week 8 to 12 as a result of experimental *Fasciola gigantica* infection is consistent with earlier reports observed in small ruminants (Radostits *et al*; 2000; Eguale *et al*; 2009 and Adama *et al*; 2011) that trematodes cause serious economic losses mostly through reduction in weight and productivity as well as increased mortality. The higher weight gain observed in T_3 (control group) confirmed earlier report (Hussein *et al*; 1983) that goats gain more weight and utilize feed more efficiently under supplementary feeding, particularly under stall fed conditions.

Post mortem examination of the dead animal shows haemorrhagic liver, with areas of necrosis due to extensive liver damage as a result of migration through the liver tissues, this clearly agrees with the findings of (Eguale *et al*; 2009); the authors worked on experimental infection of Ethiopian sheep breeds using Fasciola *hepatica* and recovered several immature flukes from the liver parenchyma showing extensive liver damage. The pathology observed was further confirmed by the recovery of immature flukes from the liver parenchyma which might have caused some levels of damage to the liver cells.

Conclusion

It was concluded that the supplemented infected group showed higher resistance to *Fasciola gigantica* infection as compared to the non-supplemented infected group. Similarly, gross pathological observations revealed greater damage to liver tissues in non-supplemented infected animal that died at week 10 post-infection. It is recommended that supplemental feeding particularly during dry season periods of the year be given to small ruminants in order to minimize the effect of disease conditions

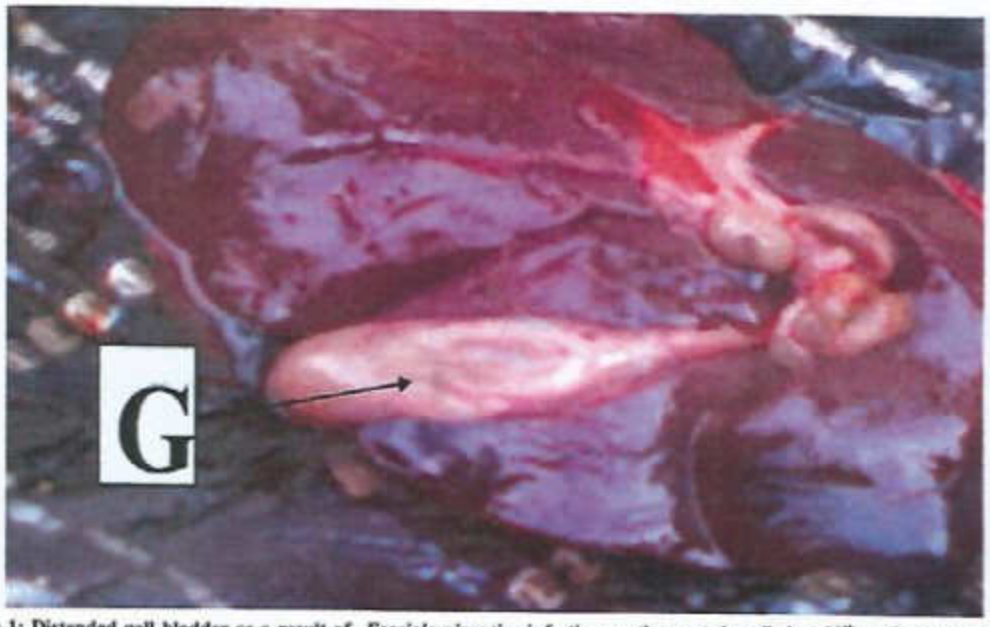

Plate 1: Distended gall bladder as a result of *Fasciola gigantica* infection on the goat that died at 10th week post-infection. Note: distended gall bladder (G).

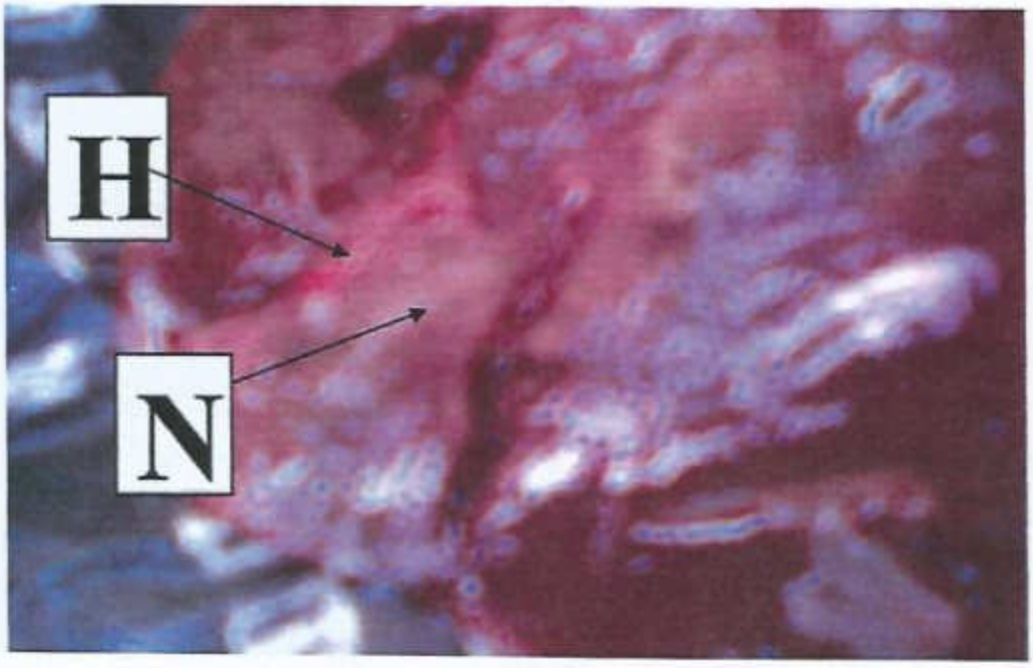

Plate II: Haemorrhagic liver showing the area of necrosis (N) on the infected liver at 10th week Post-infection. Note: Areas of haemorrahge (H).

Plate III: A picture of an emaciated goat without supplementation (T_2) as a result of *Fasciolagigantica* infection at 7th week post-infection.

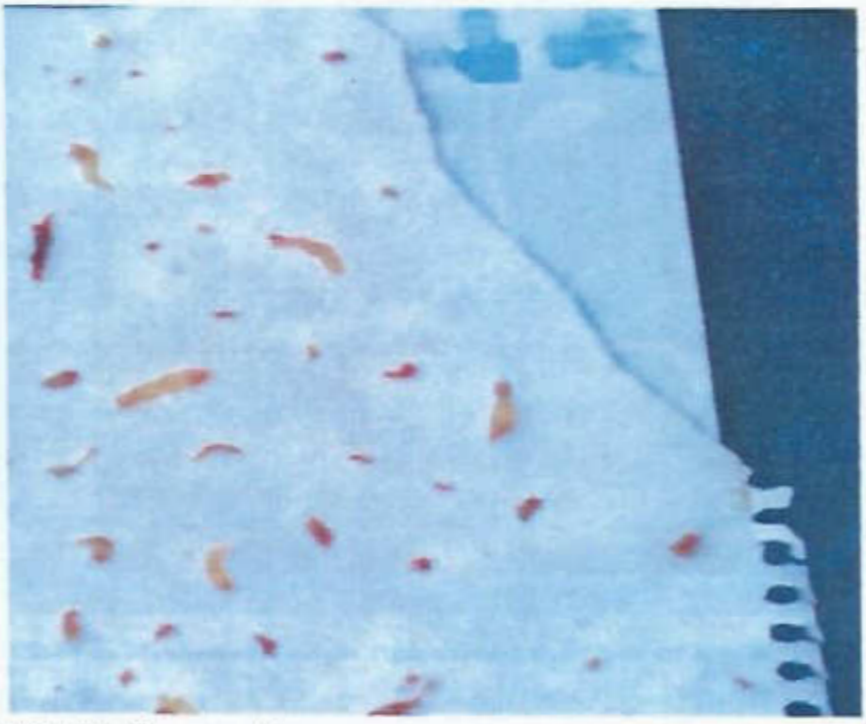

Plate IV: Recovered immature worms from the liver of a goat without supplementation (T_2) at 10th week post-infection

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