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Prevalence of gastrointestinal helminth parasites of cattle in Kugiya Market, Bukuru, Jos South LGA, Plateau State, Nigeria

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Abstract

Gastrointestinal helminth infection in cattle caused by trematodes (flukes), cestodes (tapeworms), and nematodes (roundworms) causes significant diseases which may result to growth retardation and significant economic damage. An investigation of gastrointestinal parasites of cattle sold at Kugiya market Bukuru, Jos South LGA was carried out between January and April 2016. Faecal samples of 232 cattle were examined using floatation method (Saturated Salt Solution). All the samples had gastrointestinal parasites. Nineteen 19(100%) species of gastrointestinal parasites were encountered, 2(3.88%) of which are protozoans, while the remaining 17(96.12%) were helminths as follows: 5(17.67%) trematodes (including 1 amphistome), 1(12.07%) cestode and 11(17.67%) nematodes species. The most frequently encountered were nematodes with a prevalence of 66.38% (in 154 samples), followed by the trematodes in 41 samples with a prevalence of 17.67%, cestodes in 28(12.07%) and the least protozoa in 9(3.88%). The parasites encountered are *Dicrocoelium dendrititcum* 8(3.45%), *Taenia saginata* 28(12.07%), *Ostertagia ostertagi* 16(6.89%), *Trichuris trichuiria* 13(5.60%), *Oesophagustomum radiatum* 16(6.89%), *Bunostomum phlebotomum* 22(9.84%), Amphiostomes species 15(6.47%), *Haemonchus contortus* 16(6.89%), *Cooperia pectinata* 19(8.19%), *Trichostrongylus axei* 11(4.74%), *Dicrocoelium hospes* 5(2.16%), *Strongyloides papillosus* 11(4.74%), *Fasciola hepatica* 7(3.02%), *Fasciola gigantica* 6(2.59%), *Oesophagustomum* species 12 (5.17%), *Dictyocaulus viviparous* 7 (3.02%), *Ascaris vitulorum* 11(4.74%), *Eimeria bovis* 3(1.29%) and *Eimeria zuernii* 6 (2.59%). The cestode, *T. saginata* had the highest prevalence of 12.07% while the protozoa, *E. bovis* had the lowest 1.29%. Sex and age-related infection were not significantly different at $P > 0.05$. Likewise, the source, breed and stool consistency related infection were not significantly different.

Keywords: Gastrointestinal; Helminth parasites; Nematode; Trematodes; Cestodes; EDTA bottle

1. Introduction

Cattle, the most prominent domesticated livestock in Nigeria, represent a valuable asset in both traditional and modern agriculture; in addition, they also provide meat, milk, skin, and draught power for farming [1]. In some traditional settings, they also play an essential role in the socioeconomic system, representing family wealth or they can be regarded as a survival kit by nomadic people [2]. Nigeria had a mean cattle population of 13.9 million as at 1990 of which 11.5 million of this population were kept under pastoral system [3] and 2.4 million in the villages [4]. In Nigeria, the livestock sector contributes 5.2% of the gross domestic products (GDP) while cattle production solely contributes 50% of the total meat [5]. Meat is one of the most important livestock products, although there could be losses due to various diseases including helminth infections. The quantity of meat and revenue obtained from domestic livestock is

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far below the national demand due to factors such as death and ill health with associated reduced productivity and increased cost of treatment [6; 7; 8].

Helminths are known to be a major constraint to ruminants' well-being and productive performance [9; 10; 11]. Gastrointestinal helminths are ubiquitous parasitic agents of livestock especially ruminants and are known to limit cattle production in many areas and countries [9; 11]. Mortality of animals due to parasitic diseases may not be alarming at times but their indirect effects on livestock productivity and their zoonotic impact on human health are considerably greater [12; 13; 14]. Indirect losses associated with helminth infections include the reduction in productive potential such as decreased growth rate, weight loss, diarrhea, anorexia, and sometimes anaemia [15; 16; 17].

The most important predisposing factors of helminth infections are grazing habits, climate, nutritional deficiency, pasture management, immunological status, vector, presence of intermediate host, and the number of infective larvae and eggs in the environment [18]. The effect of helminth infections is determined by a combination of factors, of which the varying susceptibility of the host species, the pathogenicity of the parasite species, the host/parasite interaction, and the infective dose are the most important [19].

Although there are many species of worm parasites harbored in the gastrointestinal and respiratory tracts of cattle, only a few target species are clinically and economically important. These include the brown stomach worm Ostertagia the coccidia Eimeria bovis and the lungworm Dictyocaulus. Clinically, the parasites of the stomach and intestine cause anemia, scouring, depression and even death, but clinical parasitism occurs infrequently. The effects of parasitism usually are insidious and subclinical, such as indigestion and poor feed conversion, less than expected weight gain and (for brood cows) decreased milk production [13]. Parasitic infections particularly gastrointestinal helminths pose a serious health threat and negatively impacts livestock production via its associated morbidity, mortality, treatment and control costs. Most of these parasitic infections are zoonotic and thus could pose a deleterious threat to public health. The incidence and severity of gastrointestinal parasites are influenced by the climate, number of infective eggs and larva in environments, pasture management, presence of intermediate host, vectors, grazing habits, and nutritional status [20]. The following are genera of parasitic helminths: *Haemonchus spp, Trichostrongylus spp, Strongyloides spp, Oesophagostomum spp,* Hookworm *(Bunostomum spp),* Roundworm *(Toxocara vitulorum),* Whipworm *(Trichuris spp), Capillaria spp,* digenetic trematodes *(Paramphistomum spp), Fasciola spp,* and Cestodes *(Moniezia spp*).

These helminths are capable of producing parasitic gastritis in cattle. Gastrointestinal helminth parasites are ubiquitous parasitic agents of livestock especially ruminants and are known to limit cattle production in Nigeria [1]. Infections with parasitic nematodes have a significant impact on global health and socioeconomic development. In tropical countries, including Sudan, parasitic nematodes are among the most widespread pathogens of humans and animals [2]. *Haemonchus placei* is generally recognized as a cattle parasite but infections with both species, H. contortus and H. placei, occasionally do occur in younger cattle and cause similar disease as in sheep and goats [23].

The problem of helminth infection is determined by a combination of factors of which the varying susceptibility of the host species, the pathogenicity of the parasite's species, the host interaction and the infective dose are important. The most important predisposing factors of helminth infections are grazing habits, climate, nutritional deficiency, immunological status, presence of intermediate host and the number of infective larvae and eggs in the environment [24]. Parasitic gastroenteritis has been noted as major constraint to ruminants' productivity in terms of pathology and economic importance [25] on a clinical and subclinical level [26]. These nematodes (*Haemonchus*, *Trichostrongylus* and *Cooperia*) cause impaired digestion and also affect the absorption of minerals particularly calcium and phosphorus. The livestock animal digestive tract infestation by helminths and protozoan may cause significant economic losses [27]. Cattle are used in special ceremonies such as wedding and burial in most part of Nigeria. However, parasitic disease coupled with inadequate management hampered the productive husbandry of these animals [28]. It is recognized that ruminant grazers and other animals could be undergoing gastrointestinal infestations leading to economic losses without clinical signs [29].

Subclinical diseases are often ignored resulting in heavy economic loss. The economic losses due to subclinical problems in the population are significantly higher than clinical problems in individual animals [30]. A prerequisite for disease control/prevention is to identify factors responsible for that disease. Knowledge of the risk factors facilitates the identification of categories of animals that are at particular risk of developing an infection [31]. Pathognomonic clinical signs of a disease help in non-laboratory diagnosis which is rapid and cheaper than laboratory diagnosis. For a rational and sustainable helminth control programme, comprehensive knowledge of the epidemiology of the disease in a specific climate and management system is a prerequisite [9].

This study aimed to determine the prevalence of gastrointestinal parasites in cattle in Kugiya market Bukuru, Jos South LGA, Plateau State with the objectives to determine the species of gastrointestinal parasites present in the cattle, determine the prevalence and distribution of gastrointestinal parasites in relation to sex and age of the cattle, breed of cattle, source of cattle and consistency of the faecal sample of cattle at Kugiya market Bukuru, Jos South LGA, Plateau State.

1.1. Study Area

This research was conducted in Kugiya market in Bukuru, Jos South L.G.A of Plateau State which is located around coordinate 9^0 46' N 8, 48E/9.767^0 N, 8.800^0 E and has an area of 5,104Km^2 (1,971m^2). The area has a temperature of 30.4 ^{0}C in March and 12.7 ^{0}C in January by Plateau State Government (Press release, 2010). Jos receives about 1,400 millimetres (55 inch.) of rainfall annually, the precipitation arising from both conventional and topographic sources, owing to the location of the city on the Jos Plateau. Kugiya is a large market where cattle are predominantly sold. Other animals sold there include sheep and goats. It is recognised nationwide for buying and selling cattle and other livestock. The market also has a health centre where the veterinarian checks the health of animals almost daily. Cattle are brought to the market from Kaduna, Gombe, Plateau, Bauchi and Sokoto states and buyers mostly from Southern part of the country and Plateau State converge there to buy them.

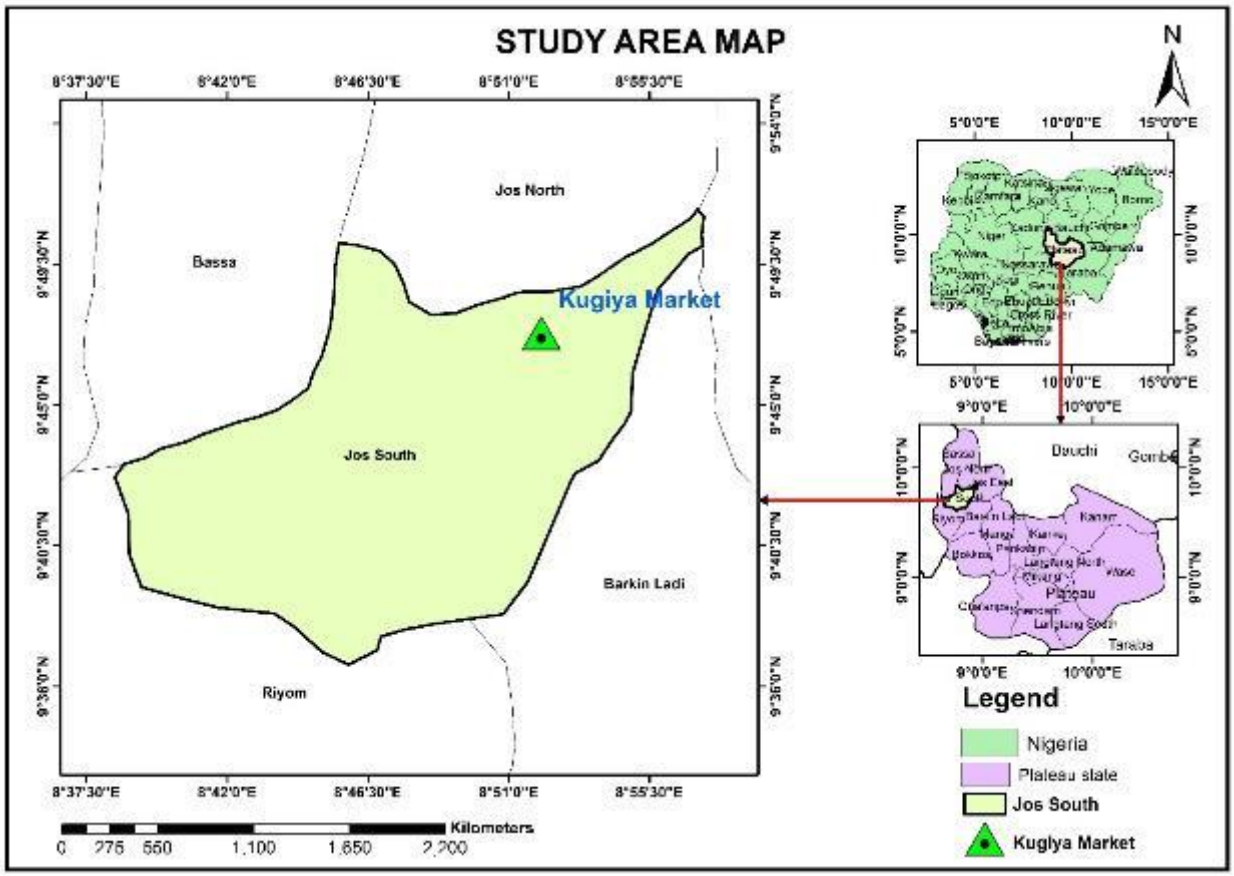

Figure 1 Map of study area

2. Materials and method

2.1. Sample Collection

Faecal samples were collected from 232 randomly selected cattle. The faeces of each animal were collected either directly from the rectum or on the ground after observing it in an act of defecation. Different hand gloves were used for each animal. 10 – 15g of the faecal sample of each animal was collected and transferred into a pre-labelled ethylenediamine tetraacetic acid (EDTA) anticoagulant specimen bottles. Adequate care was taken to exclude urine and dirt and also to prevent the specimen bottles from getting in contact with the soil, to avoid contamination of the sample.

For each animal selected, parameters such as the sex, breed, age and consistency of the faecal sample observed were recorded.

After collection, the samples were transported back to Zoology Undergraduate Parasitology Laboratory, University of Jos for microscopic examination and analysis. Samples that were not examined immediately were preserved in 10% formalin.

2.2. Laboratory Analysis and Identification of Parasites Eggs

2.2.1. Macroscopic examination of samples

The general appearance of each faecal sample was studied. The consistency of each faecal matter for each animal was recorded as follows; S (soft), W (watery), F (formed) or L (Loose). Other factors that were observed are; the presence of worm segments (proglottids), the number of undigested excrements, and gelatinous shreds of mucus or blood which help in assessing the severity of gastroenteritis. This methodology was adopted from [32].

2.2.2. Microscopic examination of samples

The floatation technique was employed for the extraction of parasite eggs for microscopic examination as described by [33]. The saturated Salt Solution was prepared by adding 500g of sodium hydroxide crystal (NaOH) to 1000ml of distilled water and the solution was mixed with a glass rod until it became homogenous. Each faecal sample was thoroughly emulsified and from each about 5g of the faeces was transferred into a beaker using a spatula. It was then mixed thoroughly with 50ml of distilled water using a glass rod. The mixture was strained into another beaker through a sieve to remove debris.

The filtrate was then gently poured into 10ml centrifuge test tubes and centrifuged for about 5 minutes. Thereafter, the supernatant in each test tube was poured off carefully taking care not to pour off the fine particle at the top of each sediment. About 15ml of the saturated salt solution was then added to the sediment in the centrifuge test tube and the sediment together with the salt solution was mixed thoroughly using a wooden applicator stick. Care was taken to ensure the removal and complete mixing of all clinging material. The test tubes were allowed to stand vertically in a wooden rack and with the aid of a dropper more salt solution was added to each test tube until a convex meniscus was formed in each test tube. A square cover slip was then placed on top of each tube with care to ensure neither air bubbles were under the cover slips nor the material overflowed. These were allowed to stand for 10 minutes to enable the eggs to float.

After about 10 minutes, each coverslip was carefully removed by a straight upward motion and then placed on a clean glass slide and observed under the microscope using X10 and X40 objectives. The various parasites eggs and oocysts were identified with reference to the work of [34; 35; and 36].

3. Results and analysis

All the 232 samples examined were positive for gastrointestinal parasites. Nineteen 19(100%) species of gastrointestinal parasites were encountered, 2(3.88%) of which are protozoans, while the remaining 17(96.12%) were helminths as follows: 5(17.67%) trematodes (including 1 amphistome), 1(12.07%) cestode and 11(17.67%) nematodes species. Nematodes had the highest prevalence with 154(66.38%) out of the total 232 samples. This was followed by trematodes 41(17.67%), Cestodes 28(12.07%) and the least prevalent group, protozoa 9(3.88%) as shown in Table 1.

The distribution of the different parasite species are: *Eimeria bovis* 3(1.29%), *Eimeria zuernii* 6(2.59%), *Dicrocoelium dendriticum* 8(3.45%), *Dicrocoelium hospes* 5(2.16%), *Fasciola hepatica* 7(3.02%), *Fasciola gigantica,* 6(2.59%) Amphistome species 15(6.47%), *Taenia saginata* 28(12.07%), *Ostertagia ostertagi* 16(6.48%), *Trichuris trichiuria* 13(5.60%), *Oesophagostomum radiatum* 16(6.89%), *Oesophagostomum* species (species not identified) 12(5.17%), *Bunostomum phlebotomum* 22(9.48%), *Haemonchus contortus* 16(6.89%), *Cooperia pectinata* 19(8.19%), *Trichostrongylus axei* 11(4.74%), *Strongyloides papillasus* 11(4.74%), *Dictyocaulus viviparus* 12(5.17%) and *Ascaris vitulorum* 11(4.74%) as shown in Table 2.

Table 3 shows the prevalence of gastrointestinal parasites of cattle according to sex. 127 out of 127 (100%) bulls and 105 out of 105 (100%) cows were infected; they are not significantly different (P>0.05). In the distribution of gastrointestinal parasites of cattle in relation to sex, the most prevalent parasites in bulls were *T. saginata* (14.17%) followed by *B. phlebotomum* (9.45%) and the least prevalent parasites were *D. hospes* (0.79%), *F. gigantica,* (1.57%) and *E. bovis* (1.57%), while in cows, the most frequently encountered parasites were *C. pectinata* (10.48%) followed by

T. *saginata* (9.52%), *O*. *ostertagi* (9.52%), *B. phlebotomum* (9.52%) and the least prevalent *E*. *bovis* (0.95%), *D*. *viviparous* (1.90%) and *E*. *zuernii* (1.90%) (See Table 4)

Table 5 shows the prevalence of gastrointestinal parasites in relation to the age of cattle. All of the 136(100%) young and 96(100%) adults sampled were infected. There is no significant difference in age-related infection at P>0.05. The most frequently encountered parasites in young was *B. phlebotomum* 15(11.03%) followed by *T*. *saginata* 13(9.56%) and the least *D*. *hospes* 2(1.47%) and *E*. *bovis* 2(1.47%). In adults, the most frequently encountered parasites was *T*. *saginata* 15(15.63%) followed by *C*. *pectinata* 9(9.38%) and the least *F. hepatica*, 1(1.04%), *F*. *gigantica* 1(1.04%) and *E*. *zuernii* 1(1.04%) as shown in Table 6.

Table 7 shows the prevalence of gastrointestinal parasites in relation to the breed of cattle sold in Kugiya market, Bukuru Jos south L.GA of Plateau State. The parasites established themselves equally in the breed as follows: all 172 out of the 172 (100%) white Fulani and 60 out of the 60(100%) Sokoto gudali breed were infected. In the white Fulani breed, the most prevalent parasites were *T. saginata* (11.63%) followed by *B*. *phlebotomum* (9.88%), *O. ostertagi* (8.72%), *O*. *radiatum* (5.81%) and *C*. *pectinata* (5.81%), *H*. *contortus* (5.81%) and *T*. *axei* (5.81%) and the least prevalent were *E*. *bovis* (1.16%) followed by *D*. *hospes* (1.74%), *F*. *gigantica* (2.33%) and *E*. *zuernii* (2.33%). In the Sokoto gudali breed, the most prevalent parasite species was *T*. *saginata* (13.33%) followed by Amphistome species (11.67%), *H*. *contortus* (10%) and *C*. *pectinata* (10%) and the least commonly encountered species were *O*. *ostertagi*, *T*. *axei*, *F*. *hepatica*, *D*. *viviparous* and *E*. *bovis* with 1.67% prevalence each as shown in Table 8.

Table 9 shows the prevalence of gastrointestinal parasites of cattle in relation to their source (i.e., where they were brought into Kugiya market from) as follows: all the 71(100%) cattle from Sokoto, 70(100%) cattle from Kaduna, 35(100%) cattle from Borno, 29(100%) cattle from Plateau and 27(100%) cattle from Bauchi were found to be infected with gastrointestinal parasites. There is no significant difference in the infection rates.

In terms of the distribution of gastrointestinal parasites of cattle in relation to their source (Table 11), the most prevalent parasite of cattle from Sokoto was *T*. *saginata* (14.08%) followed by *C. pectinata* (11.27%) and the least prevalent were *O. ostertagi*, *E*. *bovis* and *E*. *zuernii* with 1.41% prevalence each. In the cattle brought from Kaduna, the most prevalent parasite was *T*. *saginata*, *O*. *ostertagi* and *C. pectinata* with 10.00% prevalence each and the least *D. hospes*, *O. species*, *D*. *viviparus* and *E*. *bovis* with 1.43% prevalence each. The most prevalent parasite in cattle from Borno was *T. saginata* found in 9(25.71%) cattle and the least *O*. *ostertagi*, *H*. *contortus*, *C*. *pectinata*. *T*. *axei*, *F*. *hepatica* and *E*. *zuernii* had 2.86% prevalence each. *O*. *radiatum* had the highest prevalence of 13.79% in the cattle brought from Plateau and the least prevalent were *D*. *dendriticum*, *T*. *saginata*, *T*. *trichuira*, *T*. *axei*, *D*. *hospes* and *A. vitulorum* with 3.45% prevalence each. The most prevalent parasite in cattle from Bauchi were *O*. *stertagia*, *O. radiatum*, *B*. *phlebotomum* and *A*. *vitulorum* with 14.81% each and the least *T*. *saginata*, *T*. *trichiuria,* Amphistome sp., *H*. *contortus, T*. *axei* and *E*. *bovis* with 3.70% prevalence each.

Prevalence of gastrointestinal parasites of cattle based on the consistency of the faecal samples collected was not significantly different (see Table 10). The most prevalent parasites species in formed and loosed faecal samples was *T*. *saginata* 13(11.11%) and 15 (13.04%) respectively and the least *D*. *hospes*, *S*. *papillosus*, *E*. *bovis* and *E*. *zuernii* with 1.71% prevalence each and *E. bovis* 1 (0.87) in the formed and loosed faecal samples respectively (see Table 12).

Table 1 Prevalence of Gastrointestinal Parasites of Cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

Parasite group	Total No. of cattle examined	No. infected	Percentage infection (%)
Protozoa	232	9	3.88
Trematodes	"	41	17.67
Cestodes	"	28	12.07
Nematodes	"	154	66.38
TOTAL	232	232	100

Table 2 Distribution of the Gastrointestinal Parasites of Cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

Parasite species	**Total No. of cattle examined**	**No. Infected**	**Percentage +ve (%)**
Protozoa			
Eimeria bovis	232	3	1.29
Eimeria zuernii	"	6	2.59
Trematodes			
Dicrocoelium dendriticum	"	8	3.45
Dicrocoelium hospes	"	5	2.16
Fasciola hepatica	"	7	3.02
Fasciola gigantica	"	6	2.59
Amphistome spp.	"	15	6.47
Cestodes			
Taenia saginata	"	28	12.07
Nematodes			
Ostertagia ostertagi	"	16	6.89
Trichuris. Trichiuria	"	13	5.60
Oesophagostomum radiatum	"	16	6.89
Oesophagostomum species	"	12	5.17
Bunostomum phlebotomum	"	22	9.48
Haemonchus contortus	"	16	6.89
Cooperia pectinata	"	19	8.19
Trichostrongylus axei	"	11	4.74
Strongyloides papillosus	"	11	4.74
Dictyocaulus viviparus	"	7	3.02
Ascaris vitulorum	"	11	4.47
TOTAL	232	232	100

Table 3 Prevalence of Gastrointestinal Parasites in Relation to Sex of Cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

Sex	**No. examined**	**No. infected**	**Percentage infection (%)**
Bull Cow	127 105	127 105	100 100
TOTAL	232	232	100

Table 4 Distribution of Gastrointestinal Parasites in Relation to Sex of Cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

Parasite species	**No of infected cattle (%)**	**Bull** **No. Infected (%)**	**Cow** **No. Infected (%)**
Protozoa			
Eimeria bovis	3(1.29)	2(1.57)	1(0.95)
Eimeria zuernii	6(2.59)	4(3.15)	2(1.90)
Trematodes			
Dicrocoelium dendriticum	8(3.45)	4(3.15)	4(3.81)
Dicrocoelium hospes	5(2.16)	1(0.79)	4(3.81)
Fasciola hepatica	7(3.02)	4(3.15)	3(2.86)
Fasciola gigantica	6(2.59	2(1.57)	4(3.81)
Amphistome spp.	15(6.47)	7(5.51)	8(7.62)
Cestodes			
Taenia saginata	28(12.07)	18(14.17)	10(9.52)
Nematodes			
Ostertagia ostertagi	16(6.89)	6(4.72)	10(9.52)
Trichuris. Trichiuria	13(5.60)	8(6.30)	5(4.76)
Oesophagostomum radiatum	16(6.89)	9(7.09)	7(6.76)
Oesophagostomum species	12(5.17)	4(3.15)	8(7.62)
Bunostomum phlebotomum	22(9.48)	12(9.45)	10(9.52)
Haemonchus contortus	16(6.89)	13(10.24)	3(2.86)
Cooperia pectinata	19(8.19)	8(6.29)	11(10.48)
Trichostrongylus axei	11(4.74)	6(4.72)	4(4.76)
Strongyloides papillosus	11(4.74)	7(5.51)	4(3.81)
Dictyocaulus viviparus	7(3.02)	5(3.94)	2(1.90)
Ascaris vitulorum	11(4.74)	7(5.51)	4(3.81)
TOTAL	232	127(100)	105(100)

Table 5 Prevalence of Gastrointestinal Parasites in Relation to Age of Cattle Sold at Kugiya Market Bukuru Jos South LGA Plateau State

Age	**No. examined**	**No. infected**	**Percentage infection (%)**
Young Adult	136 96	136 96	100 100
TOTAL	232	232	100

Table 6 Distribution of Gastrointestinal Parasites in Relation to Age of Cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

Parasite species	**No. of infected cattle (%)**	**Young No. Infected (%)**	**Adult No. Infected (%)**
Protozoa			
Eimeria bovis	3(1.29)	2(1.47)	1(1.04)
Eimeria zuernii	6(2.59)	5(3.68)	1(1.04)
Trematodes			
Dicrocoelium dendriticum	8(3.45)	4(2.94)	4(4.17)
Dicrocoelium hospes	5(2.16)	2(1.47)	3(3.13)
Fasciola hepatica	7(3.02)	6(4.41)	1(1.04)
Fasciola gigantica	6(2.59)	5(3.68)	1(1.04)
Amphistome species	15(6.47)	9(6.62)	6(6.25)
Cestodes			
Taenia saginata	28(12.07)	13(9.56)	15(15.63)
Nematodes			
Ostertagia ostertagi	16(6.89)	10(7.35)	6(6.25)
Trichuris trichiuria	13(5.60)	5(3.68)	8(8.33)
Oesophagostomum radiatum	16(6.89)	11(8.09)	5(5.21)
Oesophagostomum species	12(5.17)	7(5.15)	5(5.21)
Bunostomum phlebotomum	22(9.48)	15(11.03)	7(7.29)
Haemonchus contortus	16(6.89)	10(7.35)	6(6.25)
Cooperia pectinata	19(8.19)	10(7.35)	9(9.38)
Trichostrongylus axei	11(4.74)	6(4.41)	5(5.21)
Strongyloides papilosus	11(4.74)	4(2.94)	7(7.29)
Dictyocaulus viviparus	7(3.02)	5(3.68)	2(2.08)
Ascaris vitulorum	11(4.74)	7(5.15)	4(4.17)
TOTAL	232	136	96

Table 7 Prevalence of Gastrointestinal Parasites in Relation to Breed of Cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

Breed of cattle	**No. examined**	**No. infected**	**Percentage infection (%)**
White Fulani Sokoto gudali	172 60	172 60	100 100
TOTAL	232	232	100

Table 8 Distribution of Gastrointestinal Parasites in Relation to Breed of Cattle of cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

		Breed of cattle examined	
Parasite species	**No. of infected cattle (%)**	**White Fulani (%)**	**Sokoto gudali (%)**
Protozoa			
Eimeria bovis	3(1.29)	2(1.16)	1(1.67)
Eimeria zuernii	6(2.59)	4(2.33)	2(3.33)
Trematodes			
Dicrocoelium dendriticum	8(3.45)	6(3.49)	2(3.33)
Dicrocoelium hospes	5(2.16)	3(1.74)	2(3.33)
Fasciola hepatica	7(3.02)	6(3.49)	1(1.67)
Fasciola gigantica	6(2.59)	4(2.33)	2(3.33)
Amphistome species	15(6.47)	8(4.65)	7(11.67)
Cestodes			
Taenia saginata	28(12.07)	20(11.63)	8(13.33)
Nematodes			
Ostertagia ostertagi	16(6.89)	15(8.72)	1(1.67)
Trichuris trichiuria	13(5.60)	9(5.23)	4(6.67)
Oesophagostomum radiatum	16(6.89)	13(7.56)	3(5.00)
Oesophagostomum species	12(5.17)	8(4.65)	4(6.67)
Bunostomum phlebotomum	22(9.48)	17(9.88)	5(8.33)
Haemonchus contortus	16(6.89)	10(5.81)	6(10.00)
Cooperia pectinata	19(8.19)	13(7.56)	6(10.00)
Trichostrongylus axei	11(4.74)	10(5.81)	1(1.67)
Strongyloides papillosus	11(4.74)	9(5.23)	2(3.33)
Dictyocaulus viviparus	7(3.02)	6(3.49)	1(1.67)
Ascaris vitulorum	11(4.74)	9(5.23)	2(3.33)
TOTAL	232	172(100)	60(100)

Table 9 Prevalence of Gastrointestinal Parasites in Relation to Source of the Cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

Source of cattle	**No. examined**	**No. infected**	**Percentage infection (%)**
Sokoto	71	71	100
Kaduna	70	70	100
Borno	35	35	100
Plateau	29	29	100
Bauchi	27	27	100
TOTAL	232	232	100

Table 10 Distribution of Gastrointestinal Parasites in Relation to Stool Consistency of the Cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

		Stool consistency	
Parasite species	No. of infected cattle (%)	Formed	Loosed
Protozoa			
Eimeria bovis	3(1.29)	2(1.71)	1(0.87)
Eimeria zuernii	6(2.59)	2(1.71)	4(3.48)
Trematodes			
Dicrocoelium dendriticum	8(3.45)	6(5.13)	2(1.74)
Dicrocoelium hospes	5(2.16)	2(1.71)	3(2.61)
Fasciola hepatica	7(3.02)	3(2.56)	4(3.48)
Fasciola gigantica	6(2.59)	4(3.42)	2(1.74)
Amphistome species	15(6.47)	7(5.98)	8(6.96)
Cestodes			
Taenia saginata	28(12.07)	13(11.11)	15(13.04)
Nematodes			
Ostertagia ostertagi	16(6.89)	11(9.40)	5(4.35)
Trichuris trichiuria	13(5.60)	8(6.84)	5(4.35)
Oesophagostomum radiatum	16(6.89)	8(6.84)	8(6.96)
Oesophagostomum species	12(5.17)	6(5.13)	6(5.22)
Bunostomum phlebotomum	22(9.48)	11(9.40)	11(9.57)
Haemonchus contortus	16(6.89)	6(5.13)	10(8.69)
Cooperia pectinata	19(8.19)	8(6.84)	11(9.57)
Trichostrongylus axei	11(4.74)	8(6.84)	3(2.61)
Strongyloides papillosus	11(4.74)	2(1.71)	9(7.83)
Dictyocaulus viviparus	7(3.02)	4(3.42)	3(2.61)
Ascaris vitulorum	11(4.74)	6(5.13)	5(4.35)
TOTAL	232	117(100)	115(100)

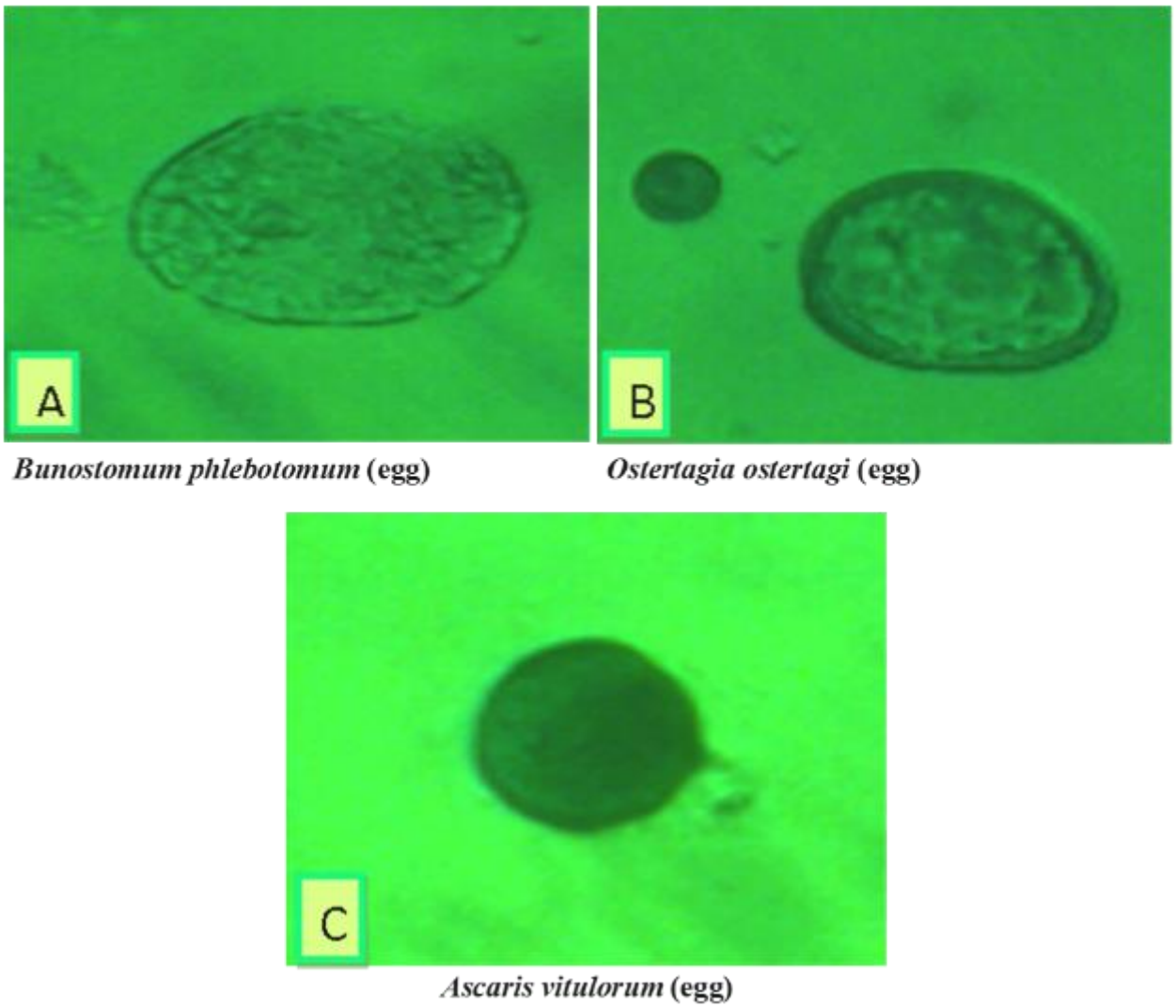

Figure 2 Ova of some nematodes examined from faecal samples of cattle sold at Kugiya Market Bukuru Jos South LGA Plateau State

4. Conclusion

The result of the study demonstrated clearly the occurrence of gastrointestinal parasite eggs in the faecal samples collected from cattle sold at Kugiya market Bukuru, Jos South LGA, Plateau State, Nigeria. All the 232 faecal sample collected were positive for nineteen (19) parasite species which comprised of two (2) species of protozoa, five (5) species of trematodes (including 1 amphistome species), one (1) species of cestodes and eleven (11) species of nematodes. Nematodes were the most prevalent parasites contributing to gastrointestinal parasitism of cattle sold at the market. The observation agrees with that of [37] who confirmed that among the gastrointestinal parasites, nematodes present the greatest potential problem to the animals and [38] those nematode parasites of large ruminants are primarily parasites of the gastrointestinal tract. Among the nematodes *Cooperia pectinata* (8.19%) was the most prevalent.

The overall result of this work revealed that the prevalence of gastrointestinal parasites from the sample site was 100%. This could probably be due to the presence of infected snails around the grazing land, favourable climatic factors and the presence of eggs and larvae of infectious parasites. With respect to the distribution of the parasite species *Taenia saginata,* the only species of cestodes encountered, had the highest rate of infection (12.07%) which correlates with [39] who in their research on the pathological effect of cestodes on ruminants discovered at post mortem that most of the death of cattle result from necrosis from cestodes. However, with respect to parasite groups, the nematodes had the highest prevalence of infection (66.08%) followed by trematodes (17.69%) (where Amphistome species was the commonest occurrence (6.47%)). The overall result agrees with the report by [40]. Some of these parasites are of

veterinary importance and are also parasites of public health concern because human infections are almost exclusively derived from ruminant sources [41]. The present result should therefore be of interest to veterinarians, cattle farmers, and health workers.

Recommendation

Infections due to gastro-intestinal parasites in cattle constitute a major constraint to profitable livestock production. It is therefore recommended that control measures such as strategic deworming programs should be embarked upon and should become a routine management practice in the market, because it is far less expensive to deworm cattle than it is to buy the feed that is wasted due to internal parasites, rotational grazing should be applied by the traders that take the cattle out for grazing, proper environmental sanitation should be practiced in the market veterinary workers should embark on quarterly deworming programs since most helminths attain maturity in 3 months, the State Government should establish animal health centers, clinics and veterinary laboratories in various strategic locations and adequately equipped to be able to control and prevent disease, enzootic and epizootic emphasis should be on preventive medicine and awareness of the cattle herdsmen on the outbreak of diseases should be emphasized.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest is to be disclosed

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