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Comparative Study of Gastrointestinal Parasites of Free Ranged and Caged Chickens in Lokoja, Kogi State

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ABSTRACT

Poultry Production plays an important role in the provision of animal protein to the timing Nigeria population and other domestic Animals. It is also vital to the nation's economy as a source of income to poultry farmers and revenue to the entire nation. Rearing of chicken on a large scale is greatly affected by parasitic diseases and their effects cause difficulties in poultry management, which may affect the productivity rate, growth rate, sometime may even lead to total extermination of the entire poultry. Helminths are important parasites of poultry production that may lead low productivity. The aim of this study was to compare the prevalence and intensity of infection of helminths in free ranged and caged chicken slaughtered in the study area. A total of 150 faecal samples were collected from the intestinal tract of slaughtered chickens in the study area were examined using sedmentation and floatation methods for the presence of adult worm, segments, ova or eggs of gastrointestinal parasites. Samples of chickens examined in the study area were found to be positive with two species from class nematoda (*Ascaridia galli* and *Heterakis gallinarum)*. The gastrointestinal cestodes identified were *Choanotaenia infundibulum*, *Raillietina echinobothrida* and Capillaria species, while the pparasites of chicken in the study area, with 49(65 .33%) of the local chicken and 19(25.33%) of the caged system chicken examined found to be infected with it. *Ascaridia galli* proved to be the second most prevalent species, with an infection rate of 31(41.33%) and 14(18.67%) for free range and caged chickens. All the 75 local chickens examined, were found to be infected with one or more gastrointestinal parasites 75 (100%). The high gastrointestinal parasites observed in the study area have a strong relationship with their mode of feeding and the birds' living conditions. This high prevalence may be responsible for reduced body weight, reduction in egg production and deaths of some or complete extermination of the whole poultry.

Keywords: Local; caged chicken; gastrointestinal; helminths; faecal and sample

INTRODUCTION

Poultry Production plays an important role in the provision of animal protein (Meat and Egg) to man and other domestic Animals. It also plays an important role in the nation's economy as a source of revenue (FAO, 2006). Poultry includes domesticated and free-range chickens which are of economic importance to man (Ohaeri, 2013). Poultry keeping is one of the major sub-sectors of agriculture. It is gaining much popularity nowadays especially in developing countries where poultry eggs and meat provide an important source of animal protein for human population (Asumang *et al.*, 2019). Poultry farming plays an important role in so many countries economies in the world (Yoriyo *et al*., 2009). Poultry farming serve as the major source of income for good percentage of the world population (Sarba *et al*., 2019). Chickens are reared in two ways system (free range and caged). Free range system is a system whereby the chicken scavenges for feeds around the surround compounds feeding on locally available resources like grains; seedlings; grasses and household refuse (Ajala *et al.*, 2020). Free

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range system is cheap to produce, but it is surrounded by so many factors like malnutrition, poor management, predators, no parasitic barrier. Losses of fowls may be attributed to poor/no housing, and low/no veterinary services. In addition, poor genetic processes due to lack of selection and predation by other animals are also effective threats to the poultry productivity according to Shecho et al. (Shecho *et al*., 2017). The scavenge chicken are generally raised in a free range system, scavenging around the compound of households, feeding on the locally available resource, like earthworm, animal and human droppings (FAO, 2006; Uhuo *et al.*, 2013). Some of the animals they feed on serve as the intermediate host of some parasitic diseases. Most of the parasitic diseases live in the gastrointestinal tract of birds, hence the name gastrointestinal parasites (Cox, 2002). Rearing of chickens on a large scale is greatly affected by parasitic diseases (Hussen *et al*., 2012). Their effects cause difficulties in poultry management, which may affect the productivity rate, growth rate, and sometime may even lead to the total extermination of the entire poultry. Helminthes (nematodes, trematodes and cestodes) are important parasites of poultry production. The chicken picks up parasite eggs directly either by ingesting contaminated feed or water as reported by Hussen *et al*., 2012.

Of all the intestinal worms, records show that *Ascaridia galli* inflicts higher damage to chicken than any other parasite (Sharma *et al.,* 2019). The severe damage is usually caused by intestinal blockage by the adult worms. Round worms and other helminths are passed directly from chicken to chicken or from parasitic eggs in faecal contaminated feeds, water or by eating directly some infected intermediate host such as grasshopper or earthworm (Nnamdi and George, 2014,; Youssef and Uga, 2014). Nematodes are the most common helminth species in poultry, as reported by some researchers, that over 50 species of this class of parasites have been recorded in poultry birds (Shifaw *et al.*, 2021). Some of them (*Ascaris galli*) have been confirmed as the major cause of most of the pathological damage in chicken and infects fowl of all ages but the greatest degree of damage is often found in young birds under 12 weeks of age (Belete *et al.,* 2016)*, c*estodes that are commonly found in poultry of free range system are tapeworms (Ogbaje, *et al*., 2012). Management of gastrointestinal parasitic diseases could be achieved, through caging, hygiene, vaccination and chemotherapy (Kantzoura *et al*.,2012). Chemotherapy and vaccination used to be the best, but current researches have shown that so many gastrointestinal parasites have developed resistance to most of the anti-helminthic drugs (Berhe et al., 2019). The major aim of this study is to compare the prevalence of gastrointestinal parasites of caged and free ranged chickens and to identify possible reasons for the variation.

MATERIALS AND METHODS

Study Area

The research was carried in Local and caged chickens sold in Lokoja old market, the capital of Kogi State. Lokoja is situated at the confluence of river Niger and Benue, it is one of the States of North Central Zone of Nigeria, and it is surrounded by eleven other states. Kogi state has boundary with four other state (Niger, Kwara, Nasarawa and Benue) and Federal capital Territory (Abuja) of the North Central zone of the country. It also has boundary with Enugu, Anambra of the South East of the country and Edo State of South South Zone. Furthermore, it also has boundary with Ondo and Ekiti state of the South western Zone. It has mean annual rainfall and temperature of 328 mm and 39^{o} C respectively (Olatunde, *et al.,2017)*. It has an estimated population of 157,780, according to the 2006 census (NPC 2009)). The inhabitants of Lokoja include civil

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servants' business men, farmers. Houses are close to one another because of the roughness of their land, and they are surrounded by water. More than 60% of the chickens sold in Lokoja are free range ones.

2.2 Sample Size

Ten (10) samples were collected after every five days, five from each sampling sites. Fifty (50) samples were collected for three months. The samples were collected through random sampling methods. The chickens are numbered and the samples were selected through balloting. For the three months 150 samples were collected for the gastrointestinal parasitic infections.

Sample Collection

The two areas where samples were collected include Lokoja old Market and Lokoja Ultra-modern market. The faecal materials were collected from the rumen of the rumen of already slaughtered chickens of free range and caged ones. The free-range system is the chickens that scavenge around the houses where they pick up feeds like insects, earthworms, human and animal faeces. The samples were collected with reference to the caged and free-range system. The samples were collected in the sterilised containers and preserved by the addition of 5% chloroform. The samples were then transported home and stored in a refrigerator at 2000^0C. The samples were then transported to the laboratory for, floatation and sedimentation methods.

Identification of the Helminths Eggs

Samples were placed into a container and labelled for each sample with their identification numbers for each sample collected. The intestinal samples were used for the detection of helminths using the sedimentation method and floatation methods.

Sedimentation method

A formal concentration technique was used to sediment the parasites. Approximately 3g of each intestinal sample was placed in a separate test tube and 8ml of 12% formal saline solution was added to each test tubes. The test tubes containing the solution were covered using a lid and were shaken vigorously for two minutes to obtain faecal suspension. The faecal suspensions were then filtered into a clean glass 8-6 tube using a single layer of cotton gauze. Then 4 mL of ether solution was added and mixed for 1min. Before, it was centrifuged at 3000 g for six minutes. Then the supernatants were gently discarded and a drop of the sediment was placed on clean glass and examined under a light microscope using x10 and x40 magnification to detect and identify helminths egg.

Floatation methods

This method was carried out using saturated NaCl salt solution as adopted from Sharma *et al*., 2019. The floatation fluid has a specific gravity of 1.2g which is higher than most helminth eggs and, therefore allow the eggs to float and accumulate in the surface layer. This made it easier for the egg to be collected. Approximately 3 g of the intestinal sample was placed into clean container and 50 mL of floatation fluid was added. The suspension was thoroughly mixed and the suspension was sieved through a layer of cotton gauze into another clean container and the solution was left undisturbed for 20min. to allow the eggs to float and accumulates in the top layer while the other particles with specific high gravity were allow to sink. The clean glass slide was placed on top of the suspension for ten minutes and was carefully removed and immediately covered with a clean coverslip and examined with light microscope using x10 and x40 objectives.

Data Analysis

The data was analysed using the SPSS package version 20. The prevalence of gastrointestinal parasites was calculated and expressed as a percentage of n/N where n is the number of chickens infected and N is the total number of chickens examined. After this Duncan's multiple range (R) was used to carry out the analysis of variance (ANOVA) to determine whether there were

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significant differences between the mean values of the prevalence of infection of Cestodes, Trematodes and Nematodes. Chi-square was used to compare the infection prevalence of the caged and free-range systems.

RESULTS

Table 1 shows that 150 faecal sample of chicken examined were positive with three (3) different classes of gastrointestinal helminths parasites namely cestodes, nematodes and trematodes. The table shows that 75(100%) of the free-range chicken is infected with one or more of the gastrointestinal helminths from these genera while caged chicken 40(53.33%) showed low prevalence of infections as compared to the free chicken. The free-range chickens had the highest number of core infection with one or two parasites from the same or different genera. The nematodes species encountered were *Ascaridia galli* (*A. galli*), *Heterakis gallinarum* (*H. gallinarum*). The gastrointestinal cestodes identified were *Choanotaenia infundibulum* (*C. infundibulum*), *Raillietina echinobothrida* (*R. echinobothrida*) and *Capillaria* secies, while the nematodes gastrointestinal trematodes isolated are *Prosthogonimus macrorchis* and *Eimeria tenella*. The table depicts that *C. infundibulum* is the most prevalent gastrointestinal parasites of chicken in the study area, with 49(65 .33%) of the local chicken and 19(25.33%) of the caged system chicken examined to be infected with it. *Ascaridia galli* proved to be second most prevalent species after *C. infundibulum* with infection rate of 31(41.33%) and 14(18.67%) for free range and caged system respectively, followed by *P. macrorchis* with infection rate 25(33.33%) and 7(9.33%) for free ranged and caged chickens respectively. The least prevalent species are *C. hepatica* with 7(9.33%) and 3(4) for Local and free ranged chickens respectively, followed by *Eimeria* tenella with a prevalence of 10(13.33%) and 2(2.67%) for local and caged chicken respectively.

The data in Table 2 shows the mean prevalence of gastrointestinal parasites of the sample examined for free range chickens. The prevalence showed high significant difference ($P<0.001$) among the different gastrointestinal parasites isolated. The cestodes proved to be the most prevalent gastrointestinal parasites among the free range system with means of 1.73, 2.07, 1.87, 2.0, 1.67 and 2.8 for a week (February, March,April, June, July and August) respectively. The second most prevalent after cestodes, are trematodes that showed prevalent means of 0.93, 0.6 0.87, 2.0 and 0.80 for the respective six months.

The data in Table 3 shows the mean prevalence of gastrointestinal parasites of the sample examined for some domesticated chickens. The prevalence showed high significant difference ($P<0.001$) among the different gastrointestinal parasites isolated. The cestodes proved to be the most prevalent gastrointestinal parasites among the free range system with means of 0.33, 0.53, 0.33, 0.73, 0.60, 2.0 for a month (February, March,April, June, July and August) respectively. The second most prevalent after cestodes, are trematodes that showed prevalent means of 0.27, 1.13, 0.13, 0.26 and 0.2 for the respective six months. The least prevalent among the gastrointestinal parasites identified is the trematodes species with 0.07, 0.00, 0.07, 0.26 and 0.2 for the six months respectively.

Table 4 shows the comparison (chi-square test) between positive percentages of cestodes, trematodes and nematodes among caged and free range chickens. The degree of parasitism observed among caged and free ranged chickens. The result showed a significant difference ($P<0.05$) among all the three genera under consideration. The free ranged chicken had the highest parasitic loads with 46.67% infected with Cestodes, followed by trematodes with 30.67%

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parasitic load. The caged chickens shows low percentage of parasitism with the highest percentage load found in cestodes with 17.33%.

DISCUSSION

The research showed the overall prevalence of gastrointestinal parasites in free ranged and caged chicken slaughtered in Lokoja, Kogi State, was 76.67%. This high incidence of infection is in agreement with the previous report of 69.2% by Uhuo, et al. (Uhuo et al., 2013) from Abakiliki but is slightly low than 91% reported by (Gazama *et al*.,2001) for his research conducted in Borno State, Nigeria. 150 faecal samples with different gastrointestinal helminths from three genera (cestodes, trematodes and nematodes) were encountered. The prevalence of gastrointestinal parasites in this study area might be as a result of continuous exposure of the free ranged chickens to conditions that facilitate infections, as it may be attributed to they way local chickens meet up with their nutrients requirements by scavenging in an hygienic environment. They take their food from the soil surface, often contaminated with some intermediate host, human faeces and animal waste, as reported by (Taiwo et al.,2016).

The entire samples (150) examined were infected with three different classes of gastrointestinal parasite species of nematodes, trematodes and cestodes. A total of seven species of parasites were identified, where trematodes species encountered with were *Ascaridia galli* (*A. galli*), *Heterakis gallinarum* (*H. gallinarum*). The gastrointestinal cestodes identified were *Choanotaenia infundibulum* (*C. infundibulum*), *Raillietina echinobothrida* (*R. echinobothrida*) and *Capillaria hepatica,* while the nematodes gastrointestinal parasites identified were *A.galli and H. galinarum and trematodes* isolated are *Prosthogonimus macrorchis* and *E. tenella*. These three classes found in this study agree with the report of (El-dakhly et al., 2019)).

All the seventy-five local chickens examined were infected with one or more gastrointestinal parasites 75 (100%). Out of the 75 free-ranged chickens, 66(88%) were found to be infected by cestodes species, which is far higher than what is recorded by (Nnamdi, 2007) (56.73%) and 5 (52.32%) in West Shoa Zone Central, Ethiopia. This discrepancy could be related to the differences in the management systems, control practices, waste disposal environmental sanitation and seasonal difference as reported by Jegede *et al*.,2015. in Gwagwalada, Abuja, Nigeria. The study also demonstrated high prevalence rate 48(53.33%) of nematodes in both the ranged and free ranged systems. Similar reports have been reported from other parts of this Nigeria; In Zaria, Kaduna State (Luka, 2007); Jos, Plateau State (Pam et al ., 2007)) and Nsuka in Enugu State (Nnamdi,, 2014).

The mean prevalence showed a significant difference ($P<0.001$) among the isolated gastrointestinal parasites. The cestodes proved to be the most prevalent gastrointestinal parasites among the free range system with the highest prevalent mean (2.8) were observed in August. The second most prevalent after cestodes, are nematodes with the highest prevalent mean in August (1.9). The least prevalent mean among the gastrointestinal parasites identified was recorded in Trematodes species with 0.00 mean in March. This agrees with the report of 7.

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Table 1: Prevalence of gastrointestinal parasites in association with the system of chicken domestication

		No. of Identified (%)							
		Cestodes			Nematodes		Trematodes		
System of domestication	**No. of tested chicken**	***C. infundibulum* (%)**	***R. echinobothria* (%)**	***C. hepatica* (%)**	***A. galli* (%)**	***H. gallinarum* (%)**	***P. macrorchis* (%)**	***E. tenella* (%)**	**N0. of Infected Chickens (%)**
Free range	75	49(65.33)	10(13.33)	7(9.33)	31(41.33)	18(24)	25(33.33)	10(13.33)	75(100)
Caged chicken	75	19(25.33)	4(5.33)	3(4)	14(18.67)	1(1.33)	7(9.33)	2(2.67)	40(53.33)
Total	150	68(45.33)	14(9.33)	10(6.67)	45(12.67)	19	32 (21.33)	12(0)	115(76.67)

Table 2: Mean Prevalence of Gastrointestinal Parasites in Free Range System Sold in Lokoja Metropolitan

	Prevalence/Month					
Helminths	**Febuary**	**March**	**April**	**June**	**July**	**August**
Cestodes	1.73	2.07	1.87	2.0	1.67	2.8
Trematodes	0.93	0.6	0.87	0.87	0.8	1.9
Nematodes	0.53	0.53	0.53	0.53	0.73	1.2
Significant difference	**	***	***	***	***	***

***= *P<0.001*

Table 3: Mean Prevalence of Gastrointestinal Parasites in Domesticated chicken Sold in Lokoja Metropolitan

Helminthes	**February**	**March**	**April**	**June**	**July**	**August**
Cestodes	0.33	0.53	0.33	0.73	0.60	2.0
Nematodes	0.27	0.13	0.13	0.26	0.20	1.20
Trematodes	0.07	0.00	0.07	0.26	0.20	0.70
Significant difference	***	***	***	***	***	

***= *P<0.001*

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Table 4: Comparative prevalence of cestodes, trematodes and nematodes among free range and caged chicken sold in Lokoja metropolitan (n= 150)

Free/caged	Cestodes positive (%)	Trematodes Positive (%)	Nematodes positive (%)
Free range	67 (46.67)	46(30.67)	39(26)
Caged	26 (17.33)	9(6)	7(4.67)
Total	93 (62)	55(36.67)	46(3067)
Chi-square	X^2=7.201, P< 0.05	X^2=5.578 P< 0.05	X^2=5.106, P< 0.05

The comparison (chi-square test) between positive percentages of cestodes, trematodes and nematodes among the caged and free-range chickens, shows that the degree of parasitism among caged and free-ranged chickens is significantly different (P<0.05). The free-ranged chicken had the highest parasitic loads with 46.67% infected with cestodes, followed by (28) trematodes with 30.67% parasitic load. The caged chickens show a low percentage of parasitism with the highest percentage load found in cestodes with 17.33%. This is attributed to their freedom to move around and scavenge on any kind of food which exposes them to so many contaminated food substances. This study agrees with the reports of Sarba et al., 2019 and Saidu et al., 2019,where higher prevalence was observed in free-range chicken than the exotics.

CONCLUSION

This study has revealed that cestodes, trematodes and nematodes are highly prevalent in chickens slaughtered in the study area (Lokoja metropolitan). This study also revealed that gastrointestinal parasites are more prevalent in free range chickens than in caged ones. Among the genera of gastrointestinal parasites encountered, cestodes proved to be prevalent than any other genera. The high gastrointestinal parasites observed in the study area have strong relationship with their mode of feeding and thebirds living conditions.

Recommendations

The main reason for the high prevalence of gastrointestinal parasites in Lokoja, is simply because the farmer and others in the poultry business lack the proper knowledge of what it takes to keep healthy poultry birds, for this reason, there is a need for continuous education on appropriate and preventive method for controlling gastrointestinal parasites in chickens.

This will help to prevent infection of gastrointestinal parasites for affecting the quality and nutritional contents of chickens consumed in Lokoja.

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