JWPR
Journal of World's Poultry Research

© 2014, Scienceline Publication

J. World's Poult. Res. 4(4): 89-93, December 25, 2014
Research Paper
PII: S2322455X1400015-4

Prevalence of Haemoparasites in Village Weaver (*Ploceus cucullatus*) in Ibadan, Nigeria

Omonona Abosede Olayemi[1*], Afusat Jagun Jubril[2] and Adewole Augustine Adekola[2]
[1]*Department of Wildlife and Ecotourism Management, University of Ibadan, Ibadan, Nigeria*
[2]*Department of Veterinary Pathology, University of Ibadan, Ibadan, Nigeria*
*Corresponding author`s Email: ao.omonona@gmail.com

Received: 18 Nov. 2014
Accepted: 11 Dec. 2014

ABSTRACT

Village weavers (*Ploceus cucullatus*) are ubiquitous passerine birds found in Nigeria. Researches on avian haemoparasites in domestic and wild birds in Nigeria have been receiving considerable attention over the years. In recent studies, the commonly reported haemoparasites include *Haemoproteus sp*, *Plasmodium sp*., *Leucocytozoon*, *Hepatozoon* and nematode microfilariae. These haemoparasites have been associated with several pathologic changes and diseases in affected birds. However, there is dearth of information on the prevalence of haemoparasites associated with village weaver in Nigeria. This present study evaluated the prevalence of haemoparasites in village weavers birds found in Ibadan, Nigeria and the associated haematological changes. 30 weaver birds were captured from the suburb of Ibadan, Oyo State, Nigeria. The buffy coat smears of the birds were made to ascertain the prevalence of haemoparasites using light microscopy to determine the morphological characteristics of the haemoparasites observed. The morphological characteristics of the haemoparasites observed were consistent with *Haemoproteus* spp., *Leucocytozoon* spp., *Plasmodium* spp., and microfilariae. Out of the total number of the village weavers sampled, 22 (73.33%) had one or more haemoparasites. *Haemoproteus* spp was observed in 19 (63.33%) birds, microfilariae was seen in 10 (33.33%) while 7 (23.33%) had *Leucocytozoon* spp with *Plasmodium* spp. in 5 (16.67%), being the least prevalent in this study. The co-infection with different haemoparasites was significant ($p<0.05$) which indicated an increased relative risk of a superimposed haemoparasite infection in already infected birds. The erythrocyte parameters and indices (PCV, RBC, MCV, MCH and MCHC) were slightly higher in the uninfected weaver birds than in the haemoparasite infected population.

Key words: Haemoparasites, Village weavers, Buffy coat smear, Haematological parameters

INTRODUCTION

Numerous haemoparasites have been associated with avian species both in the wild and the domestic birds. The utilization of several techniques has made possible the discovery of many of these haemoparasites in recent times. The identification of the morphological characteristics of the haemoparasites using light microscopy however serves as a primary technique often used for their detection and diagnosis. Some of the haemoparasites that have been documented in avian species included: *Atoxoplasma* spp., Babesia spp., *Haemoproteus* spp., *Hepatozoon* spp., *Leucocytozoon* spp., *Trypanosoma* spp., *Plasmodium* spp., and microfilaria of filaroid nematodes (Permin et al., 1998, Clark et al., 2009).

In very rare instances, the motile intermediate or free-living stages of alimentary tract-related protozoan parasites (such as Trichomonads and Histomonads) might also develop substantial parasitaemia to be detected in the blood of affected birds (Stabler, 1954 and McKeon et al. 1997).

There is significant host - species differences in the prevalence and the distribution of the different haemoparasites. The comparative pathological manifestation of haemoparasites infection in different species could range from marked pathogenic infection with remarkable morbidity and mortality to a subclinical natural infection. In lieu of this, wide disparity in the clinical expression of infection, meta-analysis and systematic review of studies have shown that "there are remarkably few reports of mortality caused by blood parasites in wild birds" (Bennett et al., 1993). Natural infection of the bobwhite quail (*Colinus virginianus*) with haemoparasites results in substantial cumulative mortality of about 20% in affected flocks. Soulsby, (1982) also reports that heavy infection of avian malaria can cause mortalities ranging from 30% to 80%.

The pathogenic manifestation of avian haemoparasites has been associated with mortalities, reproductive failure, retardation of growth, reduced

To cite this paper: Olayemi OA, Jubril AJ and Adekola AA. 2014. Prevalence of Haemoparasites in Village Weaver (*Ploceus cucullatus*) in Ibadan, Nigeria. *J. World's Poult. Res.* 4(4): 89-93.
Journal homepage: http://jwpr.science-line.com/

productivity and may exert negative effects on behavior and community structure (van Riper III et al., 1986; Atkinson et al., 1988; Sørci and Møller, 1997; Merilae et al., 1999; Merino et al., 2000; Cardona et al., 2002; Sol et al., 2003; Marzal et al., 2005 and Dunn et al., 2011).

The village weaver (*Ploceus cucullatus*) also known as the spotted-back weaver is a common passerine bird native to sub–Saharan Africa (Barlow et al., 1997). This bird species occurs in a wide range of open or semi open habitats where they are form large noisy colonies. It builds elaborate, enclosed nests in often dense colonies, and prefers the proximity to woodlands, human habitation and agriculture (Lahti et al., 2002). The village weaver bird is one of the most numerous birds in south-western Nigeria with a colony usually consisting of about 100-400 nests built on one or more trees (Funmilayo and Akande, 1976). They form large foraging flocks and nesting colonies and are often involved in synchronized competitive actions such as displacing other bird species in foraging areas and mobbing intruders near and within colonies (Lahti, 2003) and individually, they are also aggressive. These aggressive or competitive characteristics of the village weavers may function to enhance its establishment and population growth in new areas (Collias and Collias, 1964).

In Nigeria, there is dearth of information as regards the prevalence of haemoparasites in the wild avian species with most of the previous works done being on domestic poultry in the free range and those in commercial intensive holdings. The commonly reported haemoparasites in free-range poultry were *Plasmodium relictum* and *Borrelia anserine* (Abdulahi et al., 1992).

The use of the buffy coat is due to the potential of the centrifugation process to concentrate the organism in order to aid and enhance the visualization of the organisms much better than the blood smear. According to Bennett (1962) the detection of haemoparasites could be increased by centrifugation of blood and the subsequent microscopic examination. The plasma above the buffy coat layer was found to be comparatively richer in *Trypanosoma* spp and microfilariae while the stained buffy coat thin film was richer in the haemoparasites such as *Haemoproteus* spp. and *Leucocytozoon* spp.

The study of haemoparasites prevalence in weaver birds plays is an important role in elucidating the significance of haemoparasites in the ecology of the birds and the epidemiology of haemoparasites as it relates to weaver birds and other avian species. This study also provided data on the prevalence of haemoparasites in the village weaver using the light microscopy morphological characteristics as the basis for classification of the organism in the buffy coat smear.

MATERIAL AND METHODS

Study Area

This study was conducted in Ibadan, Oyo State, Nigeria. Ibadan (7°23'47" N 3°55'0"E) is located in the southwestern part of Nigeria in the Rainforest to the Guinea Savannah belt of Nigeria. The study was conducted on the month of September at the peak of the raining season. During the study, the mean relative humidity was 85%, the mean temperature was approximately 25°C.

Animals

A total of 30 adult (28 females and 2 males) village weaver birds with an average weight of 20g were captured at night using net traps when the birds were less active. The birds were trapped from their roosting sites in bushes and farmlands within Ibadan metropolis and its suburb. The village weaver birds were apparently in normal state of health and were quite active.

Blood Collection

About 0.2 ml of blood was collected aseptically from the jugular vein using a 23 gauge sterile hypodermic needle and transferred into a lithium heparin bottle to prevent coagulation.

Buffy Coat Smear Preparation

The collected blood was transferred into a plain microhaematocrit capillary tube and centrifuged using a microhaematocrit centrifuge at 3000rpm for five minutes to separate the blood cell out from the plasma and have the buffy coat layer. The area below the buffy coat is carefully marked with a diamond pencil to aid breaking of the microhaematocrit bottle. The buffy coat with some of the overlying plasma is then dropped on a clean glass slide and used to make a thin smear.

The smears were stained using Romanowsky stain and viewed under the light microscope for haemoparasite identification using the morphological characteristics of the different organisms as the basis for differentiation. The screening for the haemo-parasites was done using the microscopic examination of the buffy coat for initial detection and the thin smear was used for a more detailed morphological identification and characterization of the organism.

Data analysis

The data collected were entered into Excel spreadsheet and used for the computation of the prevalence in percentage and descriptive analysis of the haematological parameters was expressed as

Mean±S.D. The data was analyzed using SPSS v20 statistical package for the comparison of the mean using Student t-test and statistically significant differences was assumed when $P<0.05$.

RESULTS

As shown in diagram 1. *Haemoproteus* spp was the most prevalent haemoparasite observed in 22 out of the 30 subject weaver birds (63.3%). Microfilaria was observed in 10 birds (33.33%) and *Leucocytozoon* spp. was observed in 7 birds (23.33%). *Plasmodium* spp. had the least prevalence as it was observed only in 5 birds (16.67%).

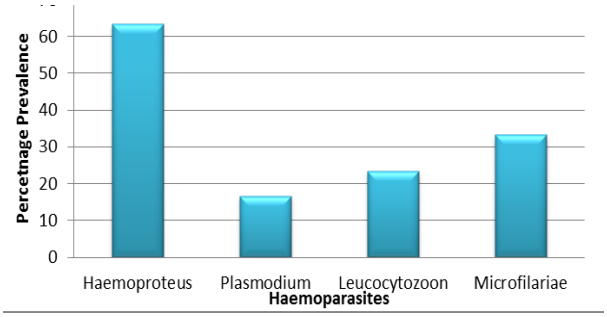

Diagram 1. Prevalence of haemoparasites in village weaver birds captured during the raining season in Ibadan, Nigeria

DISCUSSION

A review of literature did not give prior information as regards the prevalence of haemoparasites in village weaver birds. This study therefore serves as a novel report of prevalence of haemoparasite and the associated haematological changes in village weaver birds in Ibadan, Nigeria. The haemoparasites observed viz microfilaria, *Plasmodium* spp., *Haemoproteus* spp. and *Leucocytozoon* spp. are all of significant clinical relevance (Figure 1, 2 and 3). *Haemoproteus* spp (Figure 3) was the most prevalent haemoparasite observed in the parasitaemia positive village weaver birds with other haemoparasites such as microfilariae (Figure 1) and *Plasmodium* spp (Figure 2) also seen and *Leucocytozoon* spp been the least prevalent. This finding is consistent with the report from other studies in which *Haemoproteus* spp and *Plasmodium* spp were reported as the most prevalent avian haemoparasite seen (Dranzoa et al.,1999 and Opara et al., 2012). Other wild bird studies in which these haemoparasites have been found include wild forest birds, pigeons, spotted doves (*Streptopelia chinensis*) and crows (*Corvus splendens*) (Lee et al., 1991; Amin-Babjee and Lee, 1992; Amin-Babjee et al., 1993; Paperna 2005). The haemoparasites seen in this study have been associated with a range of clinical manifestations from subclinical to severe life-threatening clinical manifestations with high mortality sequel in affected birds (Soulsby, 1982 and Bermudez, 2003).

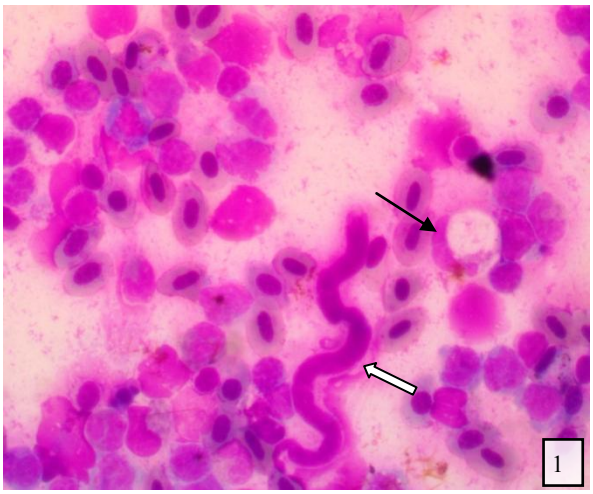

Figure 1. A microfilaria (white arrow) and a *Leucocytozoon* spp. (black arrow) in a village weaver (Giemsa stained buffy coat smear) (×1000)

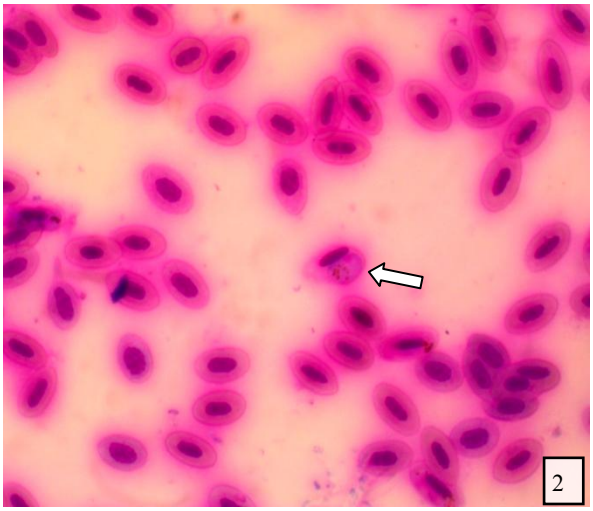

Figure 2. A *Plasmodium* spp. in a red cell (white arrow) in a village weaver (Giemsa stained buffy coat smear) (×1000)

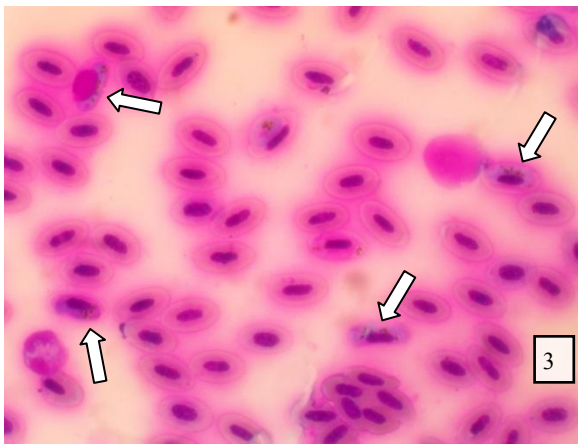

Figure 3. *Haemoproteus* spp. (white arrows) in red blood cells of village weaver bird (Giemsa stained blood smear) (×1000)

The high prevalence of haemoparasites seen in this study could also be adduced to the colony nature of

the birds, thus confining them in a single-species flock making the risk of cross-infection and spread of disease-causing pathogens to be comparatively higher than in a mixed-species flock (Ribeiro et al., 2005). This along with the geographical location of these birds in zones where some of the vectors and the disease factors mediating the survival and spread of the more common haemoparasites are abundant makes them a very important animal in the study of haemoparasites in the avian species (Wall and Shearer, 2001). This study was also conducted during the peak period of the rainy season which provides a very conducive environment for the breeding and proliferation of the arthropod vectors (*Simuliidae* and biting midges belonging to the genus *Culicoides*) of the common avian haemoparasite (Atkinson and Van-Riper, 1991; Morii, 1992 and Valkiūnas, 2005). This important role of seasonal impact on vector and the haemoparasite spread could be used as a vital tool in the institution of preventive and control measures for both domesticated and wild poultry. As reported by Tomàs et al., 2008, the role of multivariate variable like (nest size, nestling condition, female infection status, the abundance of other ectoparasites and parental provisioning rates) could affect and contribute to the total abundance of Culicoides in avian nests.

As shown in Table 1. The mean packed cell volume in the infected (45.05±2.56%) and the uninfected population (45.50±6.95%) were similar though slightly higher in the uninfected population. This finding is similar to a report by Astudillo et al., (2013) in which slightly higher PCV was reported in uninfected wild bird population. The haemoglobin concentration and the other erythrocyte indices (MCV, MCH and MCHC) were also slightly higher in the uninfected population than in the infected weaver birds.

Table 1: Comparison of erythrocyte quantitative parameters and indices (mean ± SD) among haemoparasite infected and non-infected village weaver birds captured in Ibadan, Nigeria.

Parasitaemia	Number	PCV* (%)	Hb* (g/dl)	RBC* (×10³/µL)	MCV* (fL)	MCH* (%)	MCHC* (pg)
Positive	22	45.05±2.56	9.03±0.83	3.31±0.36	138.59±12.61	27.64±4.68	19.89±2.16
Negative	8	45.50±6.95	9.35±0.92	3.24±0.37	141.29±31.54	29.21±4.62	21.30±4.40

*PCV: Packed Cell Volume, Hb: Haemoglobin, RBC: Red Blood Cell, MCV: Mean Cell Volume, MCHC: Mean Cell Haemoglobin Concentration

CONCLUSION

Over the past few years, the study of avian haemoparasites especially those of the order Haemosporidia have received considerable recognition. This is attributable to the relevance of these haemoparasitic infections and the similarity to the clinical manifestation of malaria in humans. The increased interest in the wild birds has been due to the potential ability of these birds to harbour haemoparasites, such as *Plasmodium*, which can be transmitted to other birds or animals through vectors. The migratory nature and the ability of the birds to fly over a long distance also helps to make them an excellent dispersal agent due to their ability to also serve as reservoirs of microbes and pathogens. Due to the close proximity and interaction of these weaver birds with agricultural settlements, farmlands, households and areas in which grains and insects are found, there is a very important need for us to screen their blood for haemoparasites in order to be fully acquainted with the haemoparasite they harbor and the potential threat they poses to poultry production and the human population.

Due to the ecological, behavioural and evolutionary pressures of haemoparasite infection on the life-history of the avian host, this study could serve as an important insight into the range of haemoparasites that poses detrimental ecological impact on the welfare of the weaver bird host. The evaluation of the haematological parameters in this study also serves to prove some information as regards the impact of these haemoparasites on the haematological parameters of the infected birds.

Acknowledgements

The authors wish to acknowledge Adetola Adetuga for his contribution during the course of this study

Competing Interests

The authors have declared that no competing interest exists.

REFERENCES

Abdullahi SU, Abdu PA, Ibrahim MA, George, JBD, Saidu L, Adekeye JO and Kazeem HM (1992). Incidence of diseases of poultry caused by non-viral infectious agents in Zaria, Nigeria. World Poultry Congress, Amsterdam, the Netherlands, 20-24th September, 1992. Book of Proceedings. pp. 159.

Atkinson CT and Van Riper III C (1991). Pathogenicity and epizootiology of avian haematozoa:

Plasmodium, Leucocytozoon, and Haemoproteus. In: Loye, J.E. and Zuk, M. (Eds.) Bird–parasite Interactions: Ecology, Evolution and Behavior. Oxford University Press. pp.19-48.

Atkinson CT, Forrester DJ and Greiner EC (1988). Pathogenicity of *Haemoproteus meleagridis* (Haemosporina: Haemoproteidae) in experimentally infected domestic turkeys. Journal of Parasitology, 74 (2): 228-239.

Barlow C Wacher T and Disley T (1997). A Field Guide to the Birds of the Gambia and Senegal. Pica Books, Mountfield, U.K.

Bennett GF (1962). The hematocrit centrifuge for laboratory diagnosis of hematozoa. Canadian Journal of Zoology, 40: 124–125.

Bermudez AJ (2003). Miscellaneous and Sporadic Protozoal Infections. In: Calnek, B.W, Beard, C.W., McDougald, Saif, Y.M., Eds. Diseases of poultry. Iowa State Press, Iowa, 1010- 1023.

Cardona CJ, Ihejirika A and McClellan L (2002). *Haemoproteus lophortyx* infection in Bobwhite quail. Avian Diseases. 46(1): 249-255.

Clark P, Boardman W and Raidal S (2009). Atlas of clinical avian hematology. Wiley - Blackwell Publishers, 125-161.

Collias NE, Collias EC, Jacobs CH, Cox CR and Mcalary FA (1986). Old Age and Breeding Behavior In A Tropical Passerine Bird *Ploceus cucullatus* Under Controlled Conditions. The Auk, 103: 408-419.

Dranzoa C, Ocaido M and Katete P (1999). The ecto, gastro-intestinal and haemoparasites of live pigeons (*Columba livia*) in Kampala, Uganda. Avian Pathology, 28 (2): 119-124.

Dunn JC, Cole EF and Quinn JL (2011). Personality and parasites: Sex-dependent associations between avian malaria infection and multiple behavioral traits. Behavioral Ecology and Sociobiology. 65: 1459-1471.

Funmilayo O and Akande M (1976). Ecology and agricultural pest status of the village weaverbird (*Ploceus cucullatus* Muller) in south-western Nigeria. Ghana Journal Agricultural Science, 9: 91-98.

Lahti DC (2003). A case study of species assessment in invasion biology: the Village Weaverbird *Ploceus cucullatus*. Animal Biodiversity and Conservation, 26(1): 45-55.

Marzal A, de Lope F, Navarro C and Møller AP (2005). Malarial parasites decrease reproductive success: An experimental study in a passerine bird. Oecologia, 142: 541-545.

McKeon T, Dunsmore J and Raidal SR (1997). *Trichomonas gallinae* in budgerigars and columbid birds in Perth, Western Australia. Australian Veterinary Journal 75: 652-655.

Merilae J, Sheldon BC and Lindstroem K (1999). Plumage brightness in relation to haematozoan infections in the greenfinch *Carduelis chloris*: Bright males are a good bet. Ecoscience. 6: 12–18.

Merino S, Moreno J, Sanz JJ and Arriero E (2000). Are avian blood parasites pathogenic in the wild? A medication experiment in blue tits (*Parus caeruleus*). Proceedings of the Royal Society of London B: Biological Sciences, 267: 2507–2510.

Morii T (1992). A review of Leucocytozoon caulleryi infection in chickens. Journal of Protozoology Research. 2:128–133.

Oladele SB, Enam SJ and Okubanjo OO (2012). Pathogenic Haemoparasites and Antibody to Newcastle Disease Virus from Apparently Healthy Wild Birds in Zaria, Nigeria. Veterinary World, 5(1): 13-18.

Opara MN, Ogbuewu IP, Njoku L, Ihesie EK and Etuk IF (2012). Study of the haematological and biochemical values and gastrointestinal and haemoparasites in racing pigeons (*Columba livia*) in Owerri, Imo State, Nigeria; Revista Científica UDO Agrícola, 12(4): 955-959.

Paperna I, Soh MCK, Yap CAM, Sodhi NS, Lim SLH, Prawiradilaga DM and Nagata H (2005). Blood parasite prevalence and abundance in the bird communities of several forested locations in Southeast Asia. Ornithological Science. 4:129-138.

Permin A and Hanson JW (1998). Epidemiology, Diagnosis and Control of Poultry Parasites. FAO Animal Health Manuals 4 Rome, Food and Agriculture Organization of the United Nation (FAO), Rome, Italy pp. 160.

Ribeiro SF, Sebaio F, Branquinho FCS, Marini MA, Vago AR and Braga EM (2005). Avian malaria in Brazilian passerine birds: parasitism detected by nested PCR using DNA from stained blood smears. Parasitology (2005), 130, 261–267. f 2004 Cambridge University Press DOI: 0.1017/S0031182004006596.

Sol D, Jovani R and Torres J (2003). Parasite mediated mortality and host immune response explain age-related differences in blood parasitism in birds. Oecologia, 135: 542–547

Sørci G and Møller AP (1997). Comparative evidence for a positive correlation between haematozoan prevalence and mortality in waterfowl. Journal of Evolutionary Biology. 10: 731-741.

Soulsby EJL (1982). Helminths, Arthropods and Protozoa of Domesticated Animals, 7th edn. Baillière Tindall, London.

Valkiūnas G (2005). Avian Malaria Parasites and Other Haemosporidia, CRC Press, Boca Raton, Florida. pp. 932.

Wall R and Shearer D (2001). Veterinary Ectoparasites: Biology, Pathology and Control, Second Edition. Blackwell Science pp 108-112.