ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

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International Journal of Poultry Science 9 (9): 911-915, 2010
ISSN 1682-8356
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A Study of Scavenging Poultry Gastrointestinal and Ecto-parasites in Rural Areas of Matebeleland Province, Zimbabwe

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Abstract: A study was carried out to determine endo and ecto-parasites in Matebeleland North and South from free range chickens (*Gallus domesticus*). Only adult chickens were selected for determination of parasite. For intestinal parasites microscopic studies of eggs and faecal egg counts were done using the salt floatation technique. The endo parasites encountered in the study were *Tetrameres americana*, *Acuaria hamulosa*, *Ascaridia galli*, *Heterakis gallinarum*, *H. dispar*, *Allodapa suctoria*, *Capillaria annulate*, *Raillietina echinobothrida* and *R. tetragona*. A commercially prepared insecticide constituted as follows (0.02% Tetamethrin, 0.03% pramethrin and 0.034% Imiprothrin) was applied for 2 seconds and feathers were then gentle unruffled so that ectoparasites could be counted and identified. Ecto parasites recorded in this study were *Menopon gallinae*, *Menacanthus stramineus*, *Dermanyssus gallinae*, *Argas persicus*, *Ornithonyssus bursa*, *Cnemidocoptes mutans*, *Echidnophaga gallinacean*, *Gonocoites gallinae* and *Gonocoites hologester*. The birds under study showed slow growth, poor egg hatching. Parasites should have contributed substantially to this poor growth although not single handedly.

Key words: Endo and ecto-parasites, rural poultry, slow growth

INTRODUCTION

Approximately 800 million chickens are found on the African continent. Approximately 80% of these are kept under traditional village production systems where mortality has been reported to be as high as 80-90% within the first year after hatching (Kelly *et al*., 1994; Permin *et al*., 1997; McAinsh *et al*., 2004). The importance of rural poultry in the national economy of developing countries and its role in improving the nutritional status and income of many smallholder farmers and landless communities has been very significant (Maqbool *et al*., 1998; Permin *et al*., 2002; Muchadeyi *et al*., 2004). Rural poultry production is an important agricultural activity of almost all rural communities in Africa, providing scarce animal protein in the form of meat and eggs as well as being a reliable source of petty cash. Village chickens also fulfill a number of other functions for which it is difficult to assign any monetary value. These include the fact that rural chickens play an active role in pest control and are used for traditional ceremonies and festivals (Ssenyonga, 1982; Kelly *et al*., 1994; Muchadeyi *et al*., 2004). Strategic increases in the productivity of rural chicken flocks will, therefore, greatly assist in poverty alleviation, improve household food-security and protein intake of the rural communities and in the long term curb the massive urban migration of the youth. In the villages, the poultry is left scavenging around the house during daytime to obtain what feed they may be able to get from the environment often as offal, insects and seeds (Bwangamoi, 1968; Poulsen *et al*., 2000; Ruff, 1999; Magwisha *et al*., 2002). Owing to the free range and scavenging habits, traditional village poultry is in permanent contact with soil and insects. Soil, especially when humid and warm, may serve as an important reservoir and transmission site for external larval stages of helminthes (Permin *et al*., 1997; Horning *et al*., 2003). Many insects that may act as vectors for helminths are also favoured by high temperatures and to some extent humidity. These factors may explain the wide range and distribution of nematode and cestode species in poultry, especially during the tropical rainy season (Permin *et al*., 1997; Horning *et al*., 2003). Traditional poultry production is often described as a low input/low output system. The low productivity is mainly caused by diseases, suboptimal management and lack of supplementary feed (Muchadeyi *et al*., 2004; McAinsh *et al*., 2004). Among diseases, parasitic infections are often neglected. Ecto and internal parasites on the other hand significantly restrain the growth of their host. Whereas most hosts seldom die of parasite infections, secondary clostridial infection on damaged alimentary canal lesions may cause death in the hosts (Dube and Aisien, 2005).

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Some important losses due to parasites include reduced egg production, slower growth of chicks, poor feathers, replacement birds that take long to reach maturity. Stress from parasites could affect the blood picture and aneroxia (Permin *et al*., 1997; Horning *et al*., 2003). The following parasites have been reported in chickens in some parts of Africa *Syngamus trachea*, *Gongylonema ingluvicola*, *Tetrameres Americana*, *Dispharynx nasuta*, *Acuaria hamulosa*, *Ascaridia galli*, *Heterakis gallinarum*, *H. isolonche*, *H. dispar*, *Allodapa suctoria*, *Subulura strongylina*, *Strongyloides avium*, *Capillaria annulate*, *C. contorta*, *C. caudinflata*, *C. obsignata*, *C. anatis*, *C. bursata*, *Raillietina echinobothrida*, *R. tetragona*, *R. cesticillus*, *Choanotaenia infundibulum*, *Hymenolepis carioca*, *H. cantaniana*, *Amoebotaenia cuneata*, *Metroliasthes lucida*, *Davainea proglottina* and *Polymorphus boschadis* (Permin *et al*., 1997; Horning *et al*., 2003). Nearly all studies on poultry parasites and management have been done within 80 km radius of Harare the capital city of Zimbabwe (Huchzermeyer, 1976; Kelly *et al*., 1994; Mukaratirwa *et al*., 2002; Permin *et al*., 2002; McAinsh *et al*., 2004; Muchadeyi *et al*., 2004). This invariably excluded Matebeleland provinces. The aim of the present study was to determine the prevalence of gastrointestinal helminthes and ecto-parasites in rural scavenging poultry in Matebeleland province Zimbabwe.

MATERIALS AND METHODS

The chicken population under study comprised flocks of rural, scavenging poultry in the Matebeleland Region, Zimbabwe. The area can be divided into two distinct and different climatic zones, i.e. a dry and hot area in the south, a humid and warm area in the North. The average rainfall in the different climatic zones is 400 mm in the South and 600 mm in the North. All the rain falls in the wet (rainy) season from October to April. The average temperature for the entire area is 20.7°C. Villages were randomly selected from the North and South, which gave seventeen villages in total. Dakamela, Nsuza, Cross Road, Inyathi, Sikanga, Umguza, Nkayi, Binga (North), Bezha, Buvuma, Gwatemba, Kilarny, Kezi, Kensington, Tshabalala, Matshemhlope Insiza (South). The main crops are maize, melons, sorghum varieties millet, beans, ground nuts bambara nuts, vegetables, tomatoes, onions, beans and carrots. The chicken flocks from each homestead were considered as one population. Exchange of chickens takes place between neighboring homesteads. The total number (N) of chickens ranged from 20 to 50 per population. Faecal egg counts were done using the salt floatation technique, as described by Soulsby (1982). The method involved taking 2 g of faecal sample into a test tube, adding 21 ml of water and the tube thoroughly shaken to mix the contents. The mixture was filtered using muslin cloth to discard the large debris particles and the resulting filtrate was centrifuged at 3000 g for 3 min to settle the heavier parasite eggs. The supernatant was discarded and the tubes re-filled with saturated salt solution and re-centrifuged for 2 min at 3000 g so as to float the nematode eggs in the solution whose specific gravity was between 1.10 and 1.20 (Soulsby, 1982). A glass rod was then used to transfer the floating eggs in the supernatant onto a microscope slide where they were viewed under both low and high power. In this cross-sectional study the prevalence of several species of parasites was examined. Since many factors may influence the acquisition of infections with endo-parasites, a restricted sampling method was used to prevent confounding from age and immunity by only selecting adult chickens for the study. For ecto-parasite a commercially prepared insecticide constituted as follows (0.02% Tetamethrin, 0.03% pramethrin and 0.034% Imiprothrin) was applied for 2 sec in areas where parasite could be seen. The chicken feathers were then gentle unruffled so that the parasite could drop off onto a white sheet of paper to estimate the numbers and species of the parasites. Physical inspection was done on the sleeping areas and resting areas for agarsid ticks and mites which were collected for identification. Birds were also studied while scavenging for food and doing other activities that predisposed the birds to parasites infections. Growth rate of the birds compared with commercial ones was also noted. Comparisons and statistical analysis were done on Graphpad prism 4 statistical package.

RESULTS

The chickens under each rural house hold in the study numbered between 20 and 50. What ever the number the chickens were given 500 g of grain per day, the grains were either, sorghum varieties, millet, maize or sunflower. Melon seeds were only available during the rainy season. Water was provided *ad libitum*. The chicken were released to start scavenging as early as 6 am and shut in around 6 pm. Those that slept on trees just dropped off the trees as soon as it was dawn. The chicken then went to feed on available items such as insects, earth worms, wild fruits, plant leaves, food left overs given to chickens during washing of pots used for food preparation. This had a high risk factor for predisposing birds to gastro intestinal parasites. The age range of the chickens studied were 3 weeks to 8 years. The cestodes, represented by the genus *Raillietina echinobothrida* and *Railleintina tetragona*,

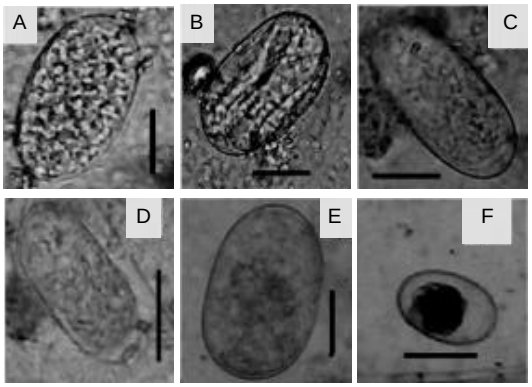

Fig. 1: Eggs of parasites recovered from free range chickens (*Gallus domesticus*) A) *Ascaridia galli* scale bar 20 µm B) *Allodapa suctoria* note larva coiled in egg, scale bar 20 µm C) *Heterakis gallinarum* scale bar 20 µm D) *H. dispar* scale bar 20 µm E) *Ornithonyssus* spp. egg scale bar 50 µm F) *Emeria tennela*, scale bar 20 µm

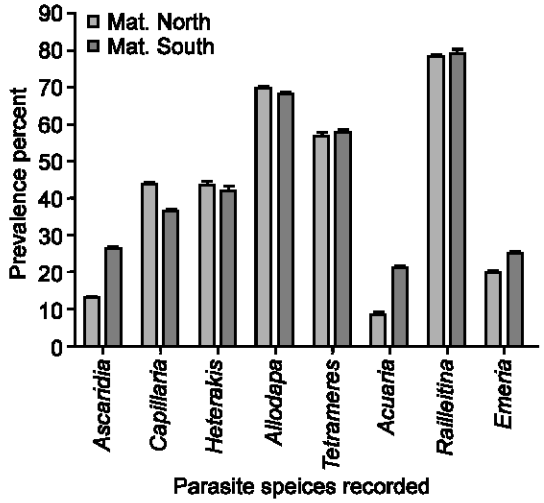

Fig. 2: Prevalence of intestinal parasites in the Matebeleland North and South from free range chickens (*Gallus domesticus*)

were the most prevalent parasites identified Fig. 2. Of the nematodes identified *Allodapa suctoria*, *Tetrameres americana* and *Capillaria annulate* were the most common Fig. 2. The only protozoan was *Eimeria tennela* which causes cocidiosis. There were no trematode parasites encountered in this study. In the adults chickens the frequency of endo parasite are shown in Fig. 2. The eggs from endo parasites identified in this study are shown in Fig. 1. The intensity of the parasites are shown in Fig. 3. The other endo parasites encountered in the study were *Acuaria hamulosa, Ascaridia galli, Heterakis gallinarum* and *Heterakis dispar*.

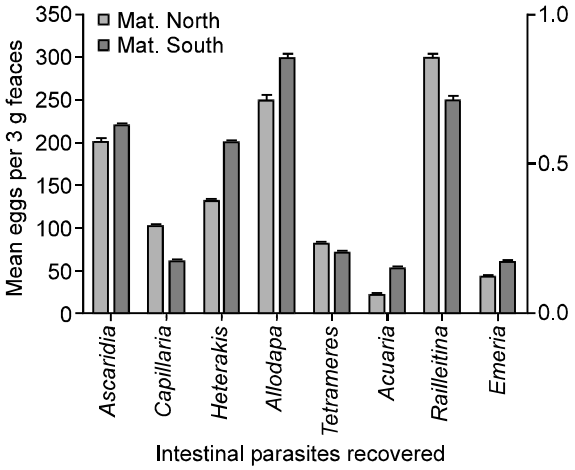

Fig. 3: Intensity of intestinal parasites in the Matebeleland North and South from free range chickens (*Gallus domesticus*) measured as number in 3 g fecal matter

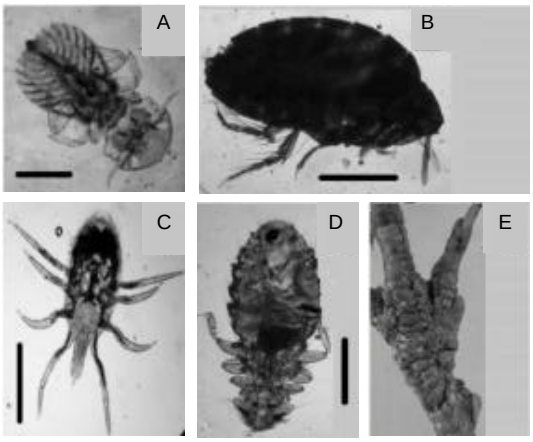

Fig. 4: Ecto parasites recovered from chicken in Matabeleland provinces A) *Gonocoites hologester* scale bar 500 µm B) *Echidnophaga gallinacean* scale bar 500 µm C) *Ornithonyssus bursa* scale bar 250 µm D) *Menacanthus stramineus* scale bar 500 µm E) *Cnemidocoptes mutans* scaly leg

Ecto parasites recorded in this study were *Menopon gallinae*, *Menacanthus stramineus*, *Dermanyssus gallinae*, *Argas persicus*, *Ornithonyssus bursa*, *Cnemidocoptes mutans*, *Echidnophaga gallinacean*, *Gonocoites gallinae*, *Gonocoites hologester*. The identity, frequency and intensity of these parasite are shown in Fig. 4, 5, Table 1 and Fig. 6 respectively. *Echidnophaga gallinacean* was responsible of the death of some chickens during the cold season. *Ornithonyssus bursa* were abundant in brooding birds causing so much irritation such that the success of hatching was reduced from 80-20%. *Argas persicus* caused birds to abandon

Table 1: The occurrence and frequency of ecto parasites in the wet and dry season

Ecto parasite	Wet/warm season frequency (%)	Dry/cold season frequency (%)
Menopon gallinae	20	10
Menacanthus stramineus	1	10
Dermanyssus gallinae	20	1
Argas persicus	30	30
Gonocoites gallinae	25	15
Gonocoites hologester	7	3
Ornithonyssus bursa	1	60
Cnemidocoptes mutans	1	1
Echidnophaga gallinacean	5	30

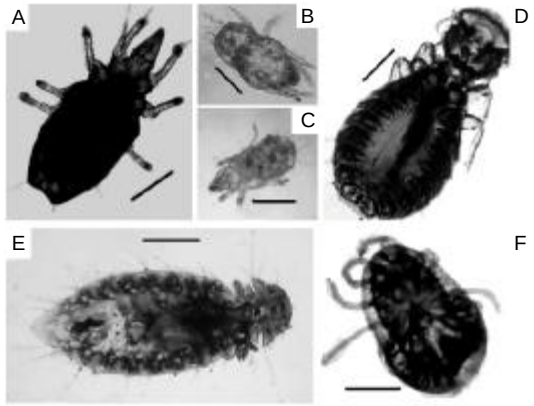

Fig. 5: Ecto parasites recovered from chicken or their sleeping areas in Matabeleland provinces A) *Dermanyssus gallinae* scale bar 250 µm B and C) *Ornithonyssus* spp. scale bar 100 µm D) *Gonocoites gallinae* scale bar 250 µm E) *Menopon gallinae* scale bar 250 µm F) *Argas persicus* scale bar 500 µm

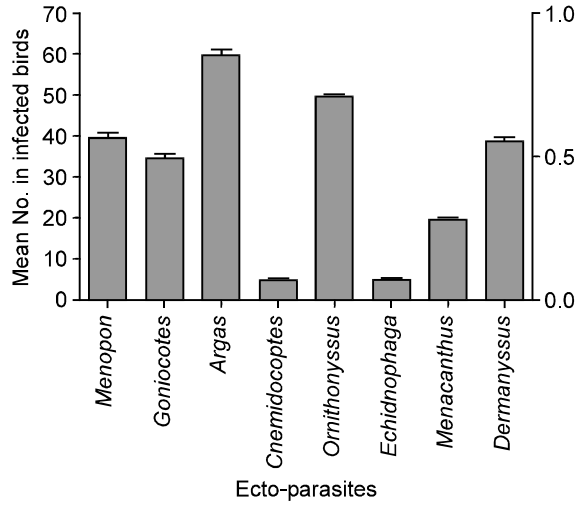

Fig. 6: Mean number of parasites per infected bird in the Matebeleland Provinces from free range chickens (*Gallus domesticus*)

their sleeping areas especially during the wet warm months. The adults did not reside on the birds but ambushed them at night and getting to crevices during the day. *Menopon gallinae*, *Menacanthus stramineus*, *Gonocoites gallinae* and *Gonocoites hologester* occurred frequently on the same birds. Such birds could be seen pecking themselves and rolling on lose soil or ashes for relief. Lice were continuously on the birds.

The common chemical applied to kill the ticks and mites was malathion. No farmers applied any medication to their birds for internal parasite. The chicken in most instances were in poor condition but this could not be solely attributed to parasites alone as the feed levels of the birds were grossly inadequate. Birds took almost a full year to reach their potential mass.

DISCUSSION

Permin *et al.* (1997) point that knowledge on the prevalence and significance of helminths in poultry in Africa seems to be rather limited as indicated by record in various countries Sudanese chickens harboured endoparasites 77.3%, Mwanza Region in Tanzania had endo parasites upto 95%. In Nigeria 54.5% of the chickens were infected with helminthes. In scavenging poultry from Northern Zimbabwe, 100% of the chickens were parasitized, but the number of different species was low. In this study in southern low Zimbabwe areas the prevalence was not 100% but the number of different species was similarly low as previously reported (Permin *et al.*, 2002). According to Ssenyonga (1982) the prevalence of *Raillietina* spp. in all the groups of birds indicated that intermediate hosts are widely distributed and accessible even to the broilers from well managed farms. In this study we also recorded similar results. The habit of free range chickens of scratching any material including cow dung to look for among other things maggots accounted for the high prevalence of Raillietina whose intermediate hosts are maggots of *Musca domestica*. With regard to endoparasites earlier studies conducted in free-range chicken in Uganda and Nigeria showed a high prevalence of helminths especially *Ascaridia Capillaria* and *Heterakis* species (Permin *et al.*, 1997). These were also the major high infestation helminth parasites identified in our study which is a result of the scavenging nature of the chicken. The abundance of *Capilaria* whose intermediate host is the earthworm and *Tetrameres* whose intermediate host is grasshoppers and cockroaches during the rainy season when these arthropods are at their peak during the rainy season could thus be explained.

The majority of the identified species are reported potentially pathogenic for poultry, in which they may cause enteritis, ulcerations or granulomas followed by anorexia, depression, emaciation and death (Soulsby, 1982). He showed that helminth infections had a significant effect on weight loss. Chicken flocks infected with a single cestode had a significant weight loss in the range of 8.4%. Mixed cestode/nematode infections

created a significant weight loss in the range of 16%. Ojok (1993) also suggests that helminth infections have a direct effect on weight. The state of nutrition was below average in approximately 70% of the chickens investigated. This might explain why in this study birds took almost a full year to reach their potential mass as opposed to observation by Dube *et al.* (2009). No farmers applied any medication to their birds for internal parasites Ecto-parasites especially mites, fleas and lice *Cnemidocoptes*. *Echidnophaga* and *Menopon* species were reported in other free range chicken studies (Permin *et al.*, 2002). In this study we also recorded similar results. The parasites like ticks have also been vehicles for transmission of pathogens (Soulsby, 1982). Poultry is a widespread practice in most countries. Dou *et al.* (2009) did a systematic study on Growth rate, carcass traits and meat quality of slow-growing chicken grown according to three raising systems namely the indoor-floor system raised in pens fitted with the solid floor, in a poultry research house that contained side curtains and fans for ventilation and cooling. The indoor-net system was similar to the indoor-floor system, except for wire netting instead of the solid floor. The free-range system was run in a similar indoor house, but with a free access to grassy paddock. The result showed the body weight and body weight gain of birds from free-range system were significantly lower than of those kept in indoor-floor system while for feed conversion ratio (feed/gain) the reverse relation was observed. It is concluded that in slow-growing chicken the free-range raising system had significant effect on growth performance. In the light of the experiments by Dou *et al.* (2009) it is suggested that the parasites contributed to the slow growth of the birds in this study. This study highlights the fact that ecto and endo parasites present a serious challenge to the well being of free range chickens in Matebeleland.

ACKNOWLEDGEMENTS

NUST Research Board funded this work. Magede Mandivenga helped in sample collections.

REFERENCES

Bwangamoi, O., 1968. Poultry helminth parasites of Uganda. Bull. Epiz. Dis. Afr., 16: 429-459.

Dou, T.C., S.R. Shi, H.J. Sun and K.H. Wang, 2009. Growth rate, carcass traits and meat quality of slow-growing chicken grown according to three raising systems. Anim. Sci. Papers Rep., 27: 361-369.

Dube, S. and M.S.O. Aisien, 2005. Studies on the Family Gastrothylacidae Stiles et Goldberger, 1910 Occurring in Nigerian Fulani Cattle. Acta Zoologica Taiwanica, 15: 1-10.

Dube, S., E. Mwenje, K. Gora and C. Dube, 2009. Studies on the effects of reducing the period of using starter mesh and application of probiotics to broiler chickens. Int. J. Poult. Sci., 8: 1128-1131.

Horning, G., S. Rasmussen, A. Permin and M. Bisgaard, 2003. Investigations on the influence of helminth parasites on vaccination of chickens against Newcastle disease virus under village conditions. Trop. Anim. Health Prod., 35: 415-24.

Huchzermeyer, F.W., 1976. Traditional poultry houses used by Rhodesian Africans. Rhod. Agric. J., 73: 155-157.

Kelly, P.J., D. Chitauro, C. Rohde, J. Rukwava, A. Majok and F. Davelaar, 1994. Diseases and management of backyard chicken flocks in Chitungwiza, Zimbabwe. Avian Dis., 38: 626-629.

Magwisha, H.B., A.A. Kassuku, N.C. Kyvsgaard and A. Permin, 2002. A comparison of the prevalence and burdens of helminth infections in growers and adult free-range chickens. Trop. Anim. Health Prod., 34: 205-214.

Maqbool, A., M. Ahmed and A. Raza, 1998. Prevalence of helminth parasites of poultry under different managemental conditions. J. Fac. Vet. Med. Univ. Tehran, 53: 103-105.

McAinsh, C.V., J. Kusina, J. Madsen and O. Nyoni, 2004. Traditional chicken production in Zimbabwe. World's Poult. Sci. J., 60: 233-246.

Muchadeyi, F.C., S. Sibanda, N.T. Kusina, J. Kusina and S. Makuza, 2004. The village chicken production system in Rushinga District of Zimbabwe. Livestock Research for Rural Development 16 (6) www.lrrd.org/lrrd16/6/much16040htm accessed 3-9-2010.

Mukaratirwa, S., T. Hove, J.B. Esmann, C.J. Hoj, A. Permin and P. Nansen, 2002. A survey of parasitic nematode infections of chickens in rural Zimbabwe. Onderstepoort J. Vet. Res., 68: 183-186.

Ojok, L., 1993. Diseases as important factor affecting increased poultry production in Uganda. Trop. Landwirt., 94: 37-44.

Permin, A., J.B. Esmann, C.H. Hoj, T. Hove and S. Mukaratirwa, 2002. Ecto-, endo- and haemo-parasites in free-range chickens in the Goromonzi District in Zimbabwe. Prev. Vet. Med., 54: 213-24.

Permin, A., H. Magwisha, A.A. Kassuku, P. Nansen, M. Bisgaard, F. Frandsen and L. Gibbons, 1997. A cross-sectional study of helminths in rural scavenging poultry in Tanzania in relation to season and climate. J. Helminthol., 71: 233-240.

Poulsen, J., A. Permin, O. Hindsbo, L. Yelifari, P. Nansen and P. Bloch, 2000. Prevalence and distribution of gastro-intestinal helminths and haemoparasites in young scavenging chickens in upper eastern region of Ghana, West Africa. Prev. Vet. Med., 45: 237-45.

Ruff, M.D., 1999. Important parasites in poultry production systems. Vet. Parasitol., 84: 337.

Soulsby, E.J.L., 1982. Helminths, Athropods and Protozoa of Domesticated Animals. 7th Edn., Bailliere Tindall, Philadelphia, pp: 1-8; 166-168; 172-174.

Ssenyonga, G.S.Z., 1982. Prevalence of helminth in parasites of domestic fowl (*Gallus domesticus*) in Uganda. Trop. Anim. Health Prod., 14: 201-204.