Open Access
Stechnolock Veterinary Science
Research Article

The Study of the Prevalence of Gastrointestinal Helminths in Chicken, A Study from Bale Zone, South East Ethiopia

Sufian Abdo[1], Sadik Zakir[1] and Suresh Kumar P Nair[2]

[1]*Jimma University College of Agriculture and Veterinary Medicine, School of Veterinary Medicine, Jimma, Ethiopia*
[2]*Department of Biomedical Sciences, Institute of Health, Jimma University Ethiopia*

***Corresponding Author:** : Sufian Abdo, Jimma University College of Agriculture and Veterinary Medicine, School of Veterinary Medicine, Jimma, Ethiopia, Tel: +251912753947, E-mail: sufianabdojilo@gmail.com

Citation: Sufian Abdo, Sadik Zakir, Suresh Kumar P Nair (2022) The Study of the Prevalence of Gastrointestinal Helminths in Chicken, A Study from Bale Zone, South East Ethiopia. Vet Sci 1: 1-9

ABSTRACT

Intestinal parasitic infection results in decreased feed conversion ratio, weight loss and lowered egg production and high mortality among the young birds. The Ethiopian poultry is mainly indigenous and it occupies an important position and plays a vital role in the national economy and revenue for rural farmers. The common intestinal parasitic infections in country chicken includecestodes, nematods and coccidians. These may cause considerable damage, nutitional loss and high revenue loss to the poor farmers of the rural villages. A cross-sectional study on gastrointestinal helminths was conducted on 144 chickens raised under traditional management system in seven kebele in and around Dellomena town of Bale zone, Ethiopia. Of these chickens, 131 (91.0%) were found to harbor one of the five different helminth parasites and 13 (9%) were free of helminths parasites. The study also found that 131 (91.0%) and 107 (74.3%) of the examined chickens were invariably infected by diverse species of cestodes and nematodes species, respectively. The major cestode species recovered from chickens were *Raillietinaechinobothrida*109(75.5%), *Raillietina tetragona*106(73.6%), *Davainea proglottina*16(11.1%). The major nematode species encountered were *Heterakis gallinarum*54 (37.5%), *Ascaridiagalli*51(35.4%), *Capillaria anatis*10 (6.9%), *Capillaria obsignata*8 (5.6%) and *Capillaria annulata*7 (4.9%). The study also tried to see the prevalence of these parasites in relation with age, sex and kebele however, it wasnot significant difference ($p>0.05$) with those risk factors. This study strongly suggested that helminthosis is a very serious problem of backyard chickens in Dello Mena district, Bale zone of Oromia and appropriate control strategies need to be devised.

Keywords: Gastrointestinal; Helminth; Chicken; Jimma; Ethiopia

Background

Poultry includes all domestic birds kept for the purpose of human food production (meat and eggs) such as chickens, turkeys, ducks, geese, ostrich, guinea fowl and doves and pigeons. In Ethiopia ostrich, ducks, guinea fowls, doves and pigeons are found in their natural habitat (wild) whereas, geese and turkey are exceptionally not common in the country. Thus the word poultry production is synonymous with chicken production under the present Ethiopian conditions and thus, the word poultry synonymous to chicken too (EARO, 1999).

In Ethiopia, the total poultry population is estimated to be about 44.89 million. By the report, poultry was including cocks, cockerels, pullets, laying hens, non-laying hens and chicks. With regard to breed, 96.46 percent, 0.57 percent and 2.97 percent of the total poultry were reported to be indigenous, hybrid and exotic, respectively (CSA, 2012).

The Poultry industry occupies an important position in the provision of animal protein (meat and egg) to man and generally plays a vital role in the national economy as a revenue provider. Poultry production in Africa and parts of Asia is still distinctively divided into commercialized and village enterprise subsector (Nnadi and George, 2010). Poultry production system in Ethiopia is an indigenous and integral part of the farming system that ranges from nil input traditional free ranges to modern production system using relatively advanced technology. There is also a small-scale intensive system with small number of birds (from 50 to 500) as an urban and peri-urban small-scale commercial system using exotic birds and relatively improved feeding, housing and health care (Mekonnen, 2007).

Hunduma, in his study, reported that disease was among the major constraints of poultry production in Rift Valley of Oromia, Ethiopia (Hundumaet *al.*,2010). The common internal parasitic infections occur in poultry include cestodes, nematodes and coccidian that may cause considerable damage and great economic loss to the poultry industry due to malnutrition, decreased feed conversion ratio, weight loss, lowered egg production and death in young birds (Puttalakshmamma, 2008). Furthermore, parasites can make the flock less resistant to diseases and exacerbate existing disease conditions (Gary and Richard, 2012) and (Katoch*et al* 2012).

Poultry coccidiosis generates economic losses due to mortality, reduced body weight plus the expenses related to preventive and therapeutic control. It is probably the most common disease in modern poultry production, where confinement rearing is practiced (Lorenzoni, 2010; and Abadi*et. al*, 2012). In agreement with Lorenzoni (2010), and Abadi*et al.,* (2012), study (Njue*et. al*, 2001) showed that coccidiosis was not common among village chickens and suggested that it is a problem more related to intensive rather than extensive management. Helminths infestations are known to cause interference with host metabolism resulting in poor feed utilization and reduced growth rate as well as size and age at maturity and these have been described as common characteristics of village chickens (Nnadi*et al.,*2007). However, study showed that parasitic infestations are usually conjoint. The concurrent infestations with two or more parasites, especially those with gastrointestinal predilection, heighten their role in early chick mortality and other productivity losses among the adults. This is particularly true of conjoint infestations with helminthes and coccidia whose combined effects on host metabolism could be devastating (Nnadi and George, 2010).

Study on the use of anthelmintics showed that to reduce losses in backyard poultry farming, the strategic deworming schedule has to be followed, so as to ensure better productivity and financial gains to the poultry owners (Katoch*et al*, 2012).

CSA report by describing the numerous negative impacts of diseases, noted that no efficient fight against disease or disease prevention is possible if descriptive data on prevalence of diseases, vaccinations, and treatments are not available. The availability of those data was also seen very important to set-up strategies that can assist in preventing and controlling diseases, by and large in improving veterinary services of the country (CSA, 2012).

Major causes of mortality in scavenging chickens kept under traditional system of management in Ethiopia include viral, protozoan and bacterial. However, the less obvious but ubiquitous, losses due to reduces productivity caused by helminthosis are economically very important to the scavenging chickens (Shamul-Islam, 1985; Abebe*et al*., 1997;Phiri*et al*., 2007).

Helminths parasites involving nematodes (roundworms), trematodes (flatworms) and cestodes (tapeworms) affecting scavenging chickens have been widely reported, with mixed infection being very common (Poulsen*et al*., 2000; Phiri*et al*., 2007). In Africa, prevalence (usually of multiple infections) of up to 100% has been reported (Ssenyonga, 1982; Oyeka, 1989; Negesse, 1991; Poulsen*et al*., 2000; Permin*et al*., 2002; Phiri*et al*., 2007).

There are currently a few in formations in Ethiopia that shows the prevalence and distribution of Gastrointestinal Tract (GIT) helminths. According to reports, the prevalence of GIT parasitism reaches 91.01% (Eshetu*et al*., 2001; Ashenafi and Eshetu, 2004). But it is limited by its coverage (region) of Ethiopia so that doesn't indicate the whole picture of the prevalence in Ethiopia.

Materials and Methods

Study Area

Dello-Menadistrict is foundin theOromyia Regional State to the direction of South east of Ethiopia about 430kms away from Addis Ababa. The altitude of the study area ranges from 850 to 2800 m.a.s.l, where the lowland area predominates with a narrow strip of high land area in the Northern part of Dello-Mena district. The area experiences a bimodal rainfall occurring from September to November and March to June. An average annual temperature of 20- 25° C and rainfall of 200 mm are recorded in Dello-Mena. Vegetation of the area changes with altitude ranging from scattered trees and bushes in the low land to dense woody forest area in the high land. Dello-Mena district is endowed with several rivers, nine perennial rivers flow across the district namely: Welmel, Yadot, Erba-1, Erba-2, Deyu, Denda, Doya, Gomgoma and Shawae. Dello-Mena district has an agricultural vocation and a mixed farming system with crop-livestock production (ref)Study design: A cross-sectional survey was conducted from November, 2014 up to March, 2015 to provide the base line information on the prevalence and distribution of GIT helminths of scavenging chickens rearing under traditional system in Dellomenna Districts.

Study population and management

The chickens used in this study were those slaughtered in, (different hotel at dellomena town and local small town and individual house during festival) rural poultry markets entirely supplied by local farmers/producers. The approach was that the health status of animals purchased from rural markets could reasonably reflect the actual situation in the rural villages from which they were originated.

Sample size and sampling methods

Sample size was calculated according to Thrusfield (2005). From the previous study done by Eshetu*et al*., 2001 found 91.01% prevalence with the comparable agroecology and this was taken as expected prevalence. With a desired absolute precision of 5 and 95% level of confidence, sample sizes of at least 120 chickens were required. About 144 chickens (both sexes) and (adult and young) of GIT were obtained or taken (16,27,20,21,20,18,22 from Mena 01, Mena 02, Wabaro, Chiri, NanigaDera, HayaOdaIrba respectively in different hotel and from individual house during festival).

Examination of chickens for type of worms

The chickens were slaughtered at different hotel and the gastrointestinal tract was obtained. The gastrointestinal tract was then separated into oesophagus, crop, proventriculus, gizzard, small intestine and caecam. Each part was opened and its contents were emptied separately into labelled beakers. Then contents were washed into a Petri dish and examined under a microscope. The larger helminths were collected directly and smaller ones were isolated under the microscope. Worms were grouped and counted before being stored in plastic bottles contains 70% alcohol according to a method described by Ashenafi and Eshetu (2004).

Identification of worms

Identification of collected helminths was done at the Laboratory of Dellomena veterinary clinic. All helminths were identified under a light microscope with 10-100x magnification using helminthological keys of Calnek*et al.* (1991) and Ashenafi and Eshetu (2004)

Statistical analysis

Descriptive statistics using SPSS (SPSS Institute, Chicago, IL, USA) was used to compute the prevalence of each helminth found in the chickens. Age and sex were examined with the prevalence of GIT parasites by χ^2 (Chi square). A p-value <0.05 was considered significant.

Result

Over all Helminth prevalence

Out of the total 144 examined chicken, 91% (131/144) were found to be infected or infested with GIT helminthes of many species. Analysis of data for the prevalence of the different species of helminthparsite out of total number of affected chicken examined indicated the highest proportion for Railatheniaechinobothrida109(75.5%) followed by Railathiniatetragona106 (73.6%), Heterakis-gallinrum54(37.5%),Ascaridgalli51(35.4%),Cappilariaanatis10(6.9%),Cappilariaobsignata8(5.6%) and Capillariaannulata7(4.9%) (Table 2).

		Frequency	
Helminth	Predilection site	No of infected	Percent
Nematode			
Ascaridiagalli	small intestine	51	35.4
Heterakisgallinarum	Cecum	54	37.5
Capillariaanatis	Cecum	10	6.9
Capillariaobsignata	Small intestine	8	5.6
Capillariaannulata	Crop and esophagus	7	4.9
Cestode			
Raillietinaechinobothrida	Small intestine	109	75.5
Raillietinatetragona	Small intestine	106	73.6
Davaineaproglottina	Small intestine	16	11.1
Total		**131**	**91**

Table 1: Prevalence of chicken parasite and their predilection site

Prevalence of cestode and nematode of examined chicken

One hundred andfourty four chickens were examined out of which 70 (64%) were females and 74(67%) were males. One hundred and thirty-one (91.0%) of the chickens were infected by helminths parasites. eight (5 nematodes and 3 cestodes) helminths species were recovered. Of the 144 chickens slaughtered and examined 90 (62.5%) and 17 (11.8%) had single and mixed nematode infections and 38 (26.4%) and 93 (64.6%) had single and mixed cestode infection, respectively. The sites with double or triple nematodes infections were the intestinal tracts, proventriculus and Caeca (Table 3).

Sex, age and kebele as risk factor

Although helminth infection was more prevalent in males (46.5) than females (44.4%), and in adults (72.2%) followed by young chicks (18.8%), there was no significance difference (P>0.05) in the prevalence of helminth parasites among sexes and age groups of the chicken. In the present study the association between the prevalence of helminth parasites and various explanatory variables such as age, sex, and kebele were observed. The prevalence of heliminth was not significantly different (p>0.05) in the different kebele of the district. (Table 3)

	No of infectected chicken	Prevalence (%)
Nematode single infection	90	62.5
Mixed infection	17	11.8
Total	107	74.3
Cestode single infection	38	26.4
mixed infection	93	64.6
Total	131	91

Table 2: Prevalence of cestode and nematode of examined chicken

Variable		Number of examined	Number of infected	percent	χ2(p value
Age	Young	29	67	18.8	0.201(0.654)
	Adult	115	104	72.2	0.201(0.654)
Sex	Female	70	64	44.4	0.035(0.853)
	Male	74	67	46.5	
Origin	Mena 01	16	13	9	0.682(0.3337)
	Mena 02	27	23	16	
	Wabaro	20	19	13.2	
	Chiri	21	18	12.5	
	Nanigader	20	20	13.5	
	hayaoda	18	17	11.8	
	irba	22	21	14.6	

Table 3: Prevalence of helminth parasites on the basis of sex, age and kebele

Discussion

The study disclosed an overall prevalence 131 (91.0%) of gastrointestinal helminths. This finding in general is comparable with previous report of 91.01% in Ethiopia (Eshetu*et al*., 2001) and 89.9% in Morocco (Hassouni and Pandy, 1989), 89.5% prevalence in Ethiopia (Heyradin*et a.,l* 2012) and 164 (86.32%) of Cestodes and 144(75.79%) of nematodes in Ethiopia (Ashenafi and Eshetu, 2004) however, slightly lower than the prevalence rate of gastrointestinal parasites of scavenging chickens which was reported to be 100% in Zimbabwe (Phiri*et al*., 2007). Furthermore, the number of identified helminth species varied from 10 (6 nematodes, 4 cestodes) in Cameroon to 15 (8 nematodes, 7 cestodes). In this study, trematodes were not observed and this observation is concurrent with previous findings (Jenkins, 2007; Abdelgader*et. al*., 2008; Marizvikuru and Patrick, 2011) where few or not at all trematodes were found in local chickens.

Trematodes are rare because a vast number of trematodes, require a wide range of hosts which may not be available. In most cases the prevailing environmental conditions might not be conducive for the perpetuation of the intermediate hosts (Junker and Boomker, 2007; Abdelgader*et al*., 2008). Thus, the life cycle of the parasites is rarely completed. In addition, trematodes are more important parasites of wild water-fowl, domesticated ducks, geese and not chickens (University of Reading, 2007) (http://www.organicvet.reading.ac.uk/poultryweb/disease/helm/helm.htm).

The overall figure indicates high prevalence of gastrointestinal helminths in local domestic chickens in DelloMena district and the chickens were infected with many different species. It might be a result of continuous exposure of chickens to the range conditions that facilitates infection. Local chickens satisfy their nutrient requirement by roaming from place to place and they usually seek their

food in the superficial layers of the soil which is often contaminated with living organisms of all kinds, including various insects or earth worm that serve as paratenic or intermediate hosts for helminths parasites that infest poultry. This indicates the importance of gastrointestinal helminths in backyard poultry farming (Hassouni and Pandy, 1989).

Raillietinaechinobothrida and *Raillietinatetragona*are considered to be studied harmful to chicken (Ashenafi and Eshetu, 2004). *Raillietinaechinobothrida*induces the formation of nodules in the intestinal wall which can lead to confusion with lesions of avian tuberculosis (Kumar, 2007) and (Calnek*et al*., 1991). Of 144 examined chickens, 109 (75.7%) prevalence was obtained. *Raillietinaechinobothrida* was the most prevalent 109(75.7%) cestode species in the chickens. Its prevalence was within the range of the prevalence of (25-84%) reported in Ethiopia (Eshetu*et al*., 2001). Other workers also reported similar prevalence rate range 34-81% for the same parasite (Poulsen*et al*., 2000; Permin*et al*., 2002; Irungu and Kassuku, 2004; Ashenafi and Eshetu, 2004 and Heyradin *et al* 2012).

Raillietinatetragona found 106 (73.6%) which is higher than the previous study 45.69% (Eshetu*et al*., 2001), 35.8% (Ashenafi*et al*., 2004) and 56.5% (Heyradin*et.al.,* 2012) in Ethiopia.The relatively higher prevalence of *Raillietina*sp. can be attributed to the wide spread and easy accessibility of intermediate hosts (dung beetles, ants) to the local scavenging chickens.

The prevalence of *Heterakisgallinarum* in the current study was 54 (37.5%). This was in line with the work ofHeyradin*et al.*(2012) who found 47(37.9%) andAshenafi and Eshetu (2004) who found 62 (32.6%). It was higher than reported to be 17.28% in Ethiopia (Eshetu*et al*., 2001), 22.8% in Kenya (Mungube*et al*., 2008), 32.8% in Zambia (Phiri*et al*., 2007) and 25.72% in South Africa (Marizvikuru and Patrick, 2011). *Heterakisgallinarum* has a major effect on the health of chicken by sharing feed, thus causing stunted growth and low productivity which may be related to damage to the intestinal mucosa (Permin*et al*., 2002). Sometimes the parasite is observed causing major irritation and inflammation to the mucosa thus interfering with the absorption of food and shows on the caeca marked inflammation and thickening of the mucosa with petechial hemorrhages. *H. gallinarum*may produce nodular diarrhea, emaciation and death (Urquhart *et al*., 1987).

Ascaridiagalli identified with the prevalence of51 (35.4%) amongst the intestinal nematodes identified in studied chickens. This was comparable with other studies of 35.58% (Eshetu*et al*., 2001) and 32.3 %(Heyradin 2012 *etal.,*) in Ethiopia and reported to be 33.3% in Kenya(Mungube*et al*., 2008), and lower prevalence of 10-14% (Irungu and Kassuku, 2004). Ashenafi and Eshetu (2004) recorded higher prevalence of 105(55.3%). In other African countries, the prevalence of *Ascaridiagalli* was comparable to the current estimate ranging 24-36% (Magwisha*et al*., 2002; Permin *et al*., 2002; Poulsen *et al*., 2000). Reasons might be the geographical variation in the distribution of the parasites or intermediate hosts of worms.

In the present study, no significant difference (P>0.05) was observed in parasitic infection due to the variation in hosts sex, age and kebele. In all kebele all parasitized chickens harboured from 1 to 4 helminths. The present result of mixed species infection is slightly lower than the previous result reported to be (up to 5,7, 10 and 13 species of GI helminths) were reported in East Shoa (Heyradin*et al.,* 2012), Dire Dawa (Gedion, 1997), Addis Ababa (Abebe*et al*., 1997) and DebreZeit (Bersabeth, 1999), respectively.

Conclusions and Recommendations

The most commonly isolated nematode and cestode species in chickens in this study wereHeterakisgallinarum 45 (37.5%), Ascaridiagalli 51 (35.4%), Raillietinaechinobothrida 109 (75.5%) and Raillietinatetragona 106 (73.6%). In the current study area sex, age and had no any significant influence on the prevalence of poultry helminths. This study indicated that cestode and nematode are a highly significant helminth problem of local chicken in that districts.

References

1. Abebe W, Asfaw T, Genete B, Kassa B, Dorchies P (1997) Comparative studies of external parasites and gastrointestinal helminths of chickens kept under different management system in and around Addis Ababa (Ethiopia), Revue Med Vet 148: 497-500.

2. Abdelgader A, Gauly M, Wollny C, Abo-Shehada M (2008) Prevalence and burden of gastro-intestinal helminthes among local chickens, in northern Jordan, Prev. Vet. Med. 85: 17-22.

3. Anwar AH, Shamim H, Shah AH, Khan MN, Akhtar MZ (2000) Pathology of cestode infection in indigenous and exotic layers. Pah. J. Agri. Sci 37: 1-2.

4. Ashenafi H, Eshetu Y (2004) Study on gastrointestinal helminths of local chickens in central Ethiopia. Revue. Med. Vet 155: 504-7.

5. Bale Zone Agricultural and Rural Development Office (BAARDO) (2007) Annual meterological and agricultural report, Oromyia region, Ethiopia 62-78

6. Bersabeth T (1999) A survey of Ectoparasites and GI helminths of Backyard chickens in three selected agro-climatic zones in central Ethiopia. Revue. Med. Vet. 155: 504-7.

7. Calnek BW, Barnes HJ, Beard CW, Reid WM, HW Yoder Jr. (1991) Diseases of Poultry. Iow. Stat. Univer. Pr. USA., 9: 723-78.

8. CSA (2012) Agricultural Sample Survey 2011/12 Report On Livestock And Livestock Characteristics (Private Peasant Holdings). Addis Ababa, Stat. Bull. 2: 532-28

9. Eshetu Y, Mulualem E, Ibrahim H, Berhanu A, Aberra K (2001) Study of Gastrointestinal helminths of scavenging chicken in four districts of Amhara Region, Ethiopia. Rev. Sci. Tech. 20: 791-6.

10.Ethiopian Agricultural Research Organization (EARO) (1999) National poultry research program: Strategy document, Addis Ababa, Ethiopia 23-32

11.Gary D, Richard D (2012) Intestinal Parasites in Backyard Chicken Flocks: Cooperative Extension Service, Institute of Food and Agricultural Sciences, Univ. Flor. Gaines 76: 32611.

12.Gedion Y (1997) Preliminary survey of ecto-parasites and gastro-intestinal tract helminths of local chickens in and around Dire Dawa. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Ethiopia 26-36.

13.Hassouni J, Pandy V (1989) Observation on helminths parasites of Domestic fowls in Zimbabwe. Zimbab. Vet. Journ., 20: 15-7.

14.Heyradin H, Hassen Ch. Yosef D, Moalegn B (2012) Gastrointestinal Helminths are highly Prevalent in Scavenging Chickens of Selected Districts of Eastern Shewa Zone, Ethiopia. Pak. Journ. Biol. Sc 15: 28.

15.Hunduma D, Regassa C Fufa D, Endale B, Samson L (2010) Major Constraints and Health Management of Village Poultry Production in Rift Valley of Oromia, Ethiopia. American-Eurasian J. Agric. & Environ. Sci. 9: 529-33.

16. Irungu G, Kassuku A (2004) A comparison of the prevalence and burdens of helminths infection in growers and adult free- range

chickens. Trop. Anim. Health Prod. 31: 205-15.

17.Jenkins M (2007) Curbing Coccidiosis in Chickens, a Fine-tuned Approach. Agric. Res. Mag 55: 2.

18.Junker K, Boomker J (2007) Helminths of guineafowls in Limpopo Province, South Africa. J. Vet. Res., 74: 265-80.29

19.Katoch R, Anish Y, Godara R, Khajuria JK, Borkataki S, Sodhi SS (2012) Prevalence and impact of gastrointestinal helminths on body weight gain in backyard chickens in subtropical and humid zone of Jammu, India. Jor. Parasitol. dis. 36: 49-52.

20.Kumar P, Ravindran R, Lakshmanan B, SenthamilSelvan P, Subramanian H, et al. (2007) Pathology of nodular tapeworm in backyard poultry. J.Parasitol. Dis. 31: 54-5.

21.Lois S (1996) Internal Parasites (Worms) of Poultry.http://www.primaryindustry.nt.gov.au

22.Lorenzoni G (2010) Poultry Diseases Influenced by Gastrointestinal Health, Traditional Treatments and Innovative Solutions. First published 2010, Nottingham University Press. 10-67

23.Magwisha H, Kassuku A, Kyvsgaard N, Permin A (2002) A comparison of the prevalence and burdens of helminth infections in growers and adult free range chickens. Trop. Anim. Health Prod., 34: 205-14.

24.Marizvikuru M, Masika P (2011) Point prevalence study of gastro-intestinal parasites in village chickens of Centane district, South Africa. Afri. Journal of Agri. Rese. 6: 2033-8.

25.Mekonnen G (2007) Characterization of the Small Holder Poultry Production and Marketing System of Dale, Wonsho and Loka Abaya Weredas of SNNPRS. MSc. Thesis, Hawassa University College of Agriculture, Hawassa, Ethiopi. 12-31

26.Negesse T (1991) Survey of internal parasites of local chickens of Southern Ethiopia. Indian J.Sci. 26: 128-9.

27.Nnadi P, George S (2010) A Cross-Sectional Survey on Parasites of Chickens in Selected Villages in the Sub humid Zones of South-Eastern Nigeria: Journ. of Parasitol. Rese 6: 141-824

28.Oyeka CA (1989) A comparison of the prevalence and burdens of helminths infection in growers and adult free-range chickens in Nambra State, Nigeria. Bull. Anim. Health Prod. Afr. 37: 217-20.

29.Permin A, Hansen JW (2003) The Epidemiology, Diagnosis and Control of Poultry Parasites: An FAO Handb. 8: 5-43.

30.Permin A, Esmann J, Hoj C, Hove T, Mukaratirwa S (2002) Ecto-,endo-and haemoparasites in free-range chickens in the Goronmonzi District in Zimbabwe.Prevent. Vet. Med. 54: 213-24.31

31.Phiri I, Phiri A, Ziela M, Chota A, Masuku M, et al. (2007) Prevalence and distribution of gastrointestinal helminthes and their effects on weight gain in free range chicken in central Zambia,Trop. Anim. Health. Prod., 39: 309-15.

32.Poulsen J, Permin A, Hindsbo O, Yelifari L, Nansen P, et al. (2000) Prevalence and distribution of gastro-intestinal helminths and haemoparasites in yound scavenging chickens in upper eastern region of Ghana, West Africa. Prevent. Vet. Med., 45: 237-24.

33.Puttalakshmamma G, Ananda K, Prathiush P, Mamatha G, Rao S (2008) Prevalence of Gastrointestinal parasites of Poultry in and around Banglore: Centre of Advanced Studies, Department of Veterinary Parasitology, Veterinary College, Karnataka Veterinary, Animal and Fisheries Sciences University, Hebbal, Bangalore-24, India. Vet. Worl. 1: 201-2.

34.Ssenyonga GSZ (1982) Prevalence of helminth in parasites of domestic fowl (Gallus domesticus) in Uganda. Trop. Anim. Health.

Prod. 14: 201-4.

35.Urquhart GM, Armour J, Duncan JL, Dunn AM, Jennings FW (1996) Veterinary Parasitology. Blac. Scie., 2: 261-4.32