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RESEARCH ARTICLE

STUDIES ON GASTROINTESTINAL PARASITES OF CHICKEN IN AND AROUND CHEYYAR TALUK, THIRUVANNAMALAI DISTRICT

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ABSTRACT

A total of 50 intestines of domestic chicken were collected in and around Cheyyar, Thiruvannamalai district from April 2014 to September 2014. The overall prevalence of parasitic infection was 91.54%. of this overall prevalence of 91.54%, 80.67% was infected with cestodes and 19.33% with nematodes. The collected tape worms (cestodes) were identified as *Raillietina tetragona*, *R.echinobothridia*, *R.cesticillus*, *Cotugnia dionophora* and *Hymenolepis carioca* and nematodes were identified as *Ascaridia galli* and *Heterakis gallinarum*. The percentage of *Raillietina tetragona*, *R.echinobothridia*, *R.cesticillus*, *Cotugnia dionophora* and *Hymenolepis carioca* were 40.00, 13.85, 9.23 and 6.92 and 3.85%, respectively. Similarly the percentage of *Ascaridia galli* and *Heterakis gallinarum* were 11.54 and 6.15%, respectively. The average number of parasite per chicken was 16.38, 14.44, 1.50, 2.0 and 2.6% of *Raillietina tetragona*, *R.echinobothridia*, *R.cesticillus*, *Cotugnia dionophora* and *Hymenolepis carioca*, respectively. Similarly the average number of parasite per chicken was 18.67 and 15.0% of *Ascaridia galli* and *Heterakis gallinarum*, respectively.

INTRODUCTION

The poultry industry occupies an important position in the provision of animal protein (Meat and Egg) to man and generally play a vital role in the national economy as a revenue provider. Poultry is one of the most intensively reared of the domesticated species and one of the most developed and profitable animal production enterprises (Obiora, 1992). It's importance in national economics of developing countries and its role in improving the nutritional status and income of many small farmers and those with small land holdings as well as landless has been recognized by various scholars and rural development agencies in the last two decades (FAO, 1987; Creevey, 1991; Kitalyi, 1998). The estimated poultry census in the world is 14.718 billion and 75% of this population is found in developing countries (Minga *et al.*, 1989), where they are commonly kept as free range chicken (Pandey, 1993). Rural free-range chickens provide eggs and meat which are important sources of protein (Abdelgader, 2008) and also as a source of income (Poulsen *et al.*, 1997). Causes of high mortality and low productivity include lack of proper management, lack of adequate nutrition, diseases and predation (Minga, 1989). Lack of adequate nutrition and proper management force the free-range chickens to scavenge for food in contaminated environment, which predisposes them to arthropod borne helminthes Poultry production in most tropical countries is based mainly on scavenging production system.

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This system exposes birds to a range of parasites (Sehgal *et al.*, 2006). However the most striking problem in relation to village poultry production is their high mortalities within the first year after hatching (Permin *et al.*, 2002). Poultry diseases continue to play a major role in directly interfering with poultry productivity, which decreases economic returns and may therefore negatively affect the development of the industry. Internal and external parasites of poultry are common in the tropics because of the favorable climatic condition for their development and the poor standards of poultry husbandry (Abebe *et al.*, 1997). Losses due to reduced productivity that is increased feed conversion ratio poor weight gain, poor egg production, caused by helminthiasis are economically very important to the poultry industry. Despite the economic significance of the parasitic disease of commercial and small scale poultry in the country, no substantial research has been reported on parasites and the economic losses due to parasitic disease of local poultry. Pinckney *et al.* (2008) found out helminth infection (66.9%) is more prevalence in poultry. Improved poultry management practices are responsible for the reduction in the incidence of parasitic infection (Puttalahshamma *et al.*, 2008). Prevalence studies have been undertaken in many tropical countries such as Nigeria (Nnadi and George, 2010), Zambia (Phiri *et al.*, 2007), Morocco (Hassoundi and Belghyti, 2006), India (Yadav and taudon, 1991) and Iran (Eslami *et al.*, 2009). India recorded the fastest growth rate in poultry meat production during 1985-95 with a growth rate about 18% per annum which perhaps, no other country or agro-industry in the world has recorded, during the period. At present more than 400 million broiler chickens are

produced annually. Intensive rising of commercial farms inevitably exposes flock to the various diseases which causes mortality and loss to the farmers. Diseased birds can also be hazardous to the human health; there may be possibilities of damage to the human body due to intake of diseased birds. In India huge loss of birds due to disease is being faced by farmers due to management related problem, poultry carry heavy infection of varied types of parasite i.e., Helminth, Protozoan's, Viruses and Arthropods etc. Intestinal parasitic helminthes have a serious impact on poultry health, productivity quality and quantity of meat. Helminth parasites of poultry birds are commonly divided into three main groups; Cestode, Nematode and Trematode. The Cestodes of significant importance are of the two genera *Rabillleitina* and *Hymenolepsis*. Nematode constitute the most important group of helminth parasite of poultry both in number of species and the extent of damage they cause, the main genera include *Ascaridia*, *Heterakis*, and *Capillaria* (Matur *et al* 2010). The prevalence and density of parasitic helminthes may be influenced by several factors, such as climatic of the parasites, resulting in dramatic changes in the prevalence and intensity of helminth infections (Magwisha *et al*, 2002). Many insects that may act as vectors for helminthes are also favored by high temperature and to some extent humidity. These factors may explain the wide range and distribution of cestode and nematode species in poultry birds, especially during the tropical rainy season (Dube *et al*, 2010).

The exotic or local breed of the domestic fowl *Gallus-gallus domesticus* Linnaeus 1758 is reared by rural and urban house holders who use their eggs and meat as a source of animal protein and farm manure (Kekeocha 1984 and Frantovo 2000). Gastrointestinal parasites which invade the host possess morphological and physiological features such as small thread like cylindrical body; hooks and hard body cuticle enhance their adaptation to long living and existence in their hosts. These parasites constitute a major factor limiting productivity of the poultry industry by affecting the growth rate of the host resulting in malfunctioning of organs and eventually death (Soulsby, 1982). Poultry production in Africa and parts of Asia is still distinctively divided into commercialized and village enterprise subsector, each with its peculiarities. The farmer comprises of strains specifically developed on the basis of primary products into parent stocks, layers and broilers each with its specialized equipments and management approach. The latter however, consists of indigenous domestic fowls (*Gallus domesticus*) variously referred to us local or rural chickens, backyard poultry or village chickens, and or free range chickens. These refer to breeds strainsecto types with no improvement history (Njue *et al.*, 2001) and chickens indigenous to the particular locality they are found. These constitute a rich genetic resource base for any future genetic improvement and production of strains adaptable to the tropics (Horst 1988). A lot of losses in poultry have been linked to diseases causing agents such as viruses, bacteria and parasites. It has been estimated that more than 750 million chickens, guinea fowls and ducklings in Africa die each year as a result of various infections (Sonaiya, 1990). Although, somewhat reduction in bird's parasitic infection has been achieved in commercial production system mostly due to improved housing, hygiene and management practices the prevalence of gastrointestinal parasites is still very rampant (Pandey, *et al.*, 1992).

Helminth parasite of poultry are commonly divided in to three main groups; nemetodes, cestodes and termatodes. Nematodes constitute the most important group of helminth parasites of poultry both in number of species and the extent of damage they cause; the main genera include *Capillaria*, *Heterakis*, and *Ascaridia* (Jordan and Pattison, 1996). The domestic chicken feeds on a wide range of food substance. This ranged from grains, fruits to insects which may harbor infective stages of parasites there by predisposing them to parasites infection particularly gastro-intestinal parasites (Oniye, *et al.*, 2001; Frantovo. 2000). Helminth parasites of chickens are prevalent in many parts of the world (Hodasi, 1978). *Ascaris galli* has been incriminated as the most common and most important parasite of poultry (Hodasi, 1978; Pam, *et al.*, 2006 Luka and Nadams, 2007). The cestodes of significant importance are of the two genera *Railletitina* and *Hymenolepsis* (Oniye *et al.*, 2001; Luka and Ndams, 2007).

MATERIALS AND METHODS

Study period

This study was conducted from April 2014 to September 2014.

Study animals and study materials

Domestic chicken has been selected as the study animal. For the present study the intact intestines of chickens were obtained from the discarded parts of six-to eight-week-old chicken, slaughtered on the day of collection. (Plate-A).

Collection of samples

The intestines of the Native chickens obtained from the chicken outlets were brought to the Department of Zoology, Arigner Anna Govt. Arts College, Cheyyar. For further confirmation the samples were send to Department of Veterinary parasitology, Madras Veterinary College, Chennai, Tamil Nadu.

Examination procedure

The examination of the bird's intestines for helminth parasites/ova was undertaken using four different methods: gross examination of the split intestine, direct examination of a smear of intestinal content, examination of the intestinal content using flotation techniques and examination for minute parasites of the intestine using physiological saline (Yacob *et al.*, 2009). The alimentary canal of each chicken was opened from the esophagus down to the rectum (Fatihu *et al.*, 1992) and all worms visible to the naked eye were collected using a pair of forceps. Recovered nematodes were preserved in 70% alcohol while cestodes were fixed with anetic formalin alcohol, stained with haematoxylin and mounted in canda balsam (Belghyti *et al.*, 1994, Oniye *et al.*, 2001). Scrapings from the intestinal mucosa from the upper, middle and lower linings of the intestine and caecum were concentrated using the formol there concentration technique (Cheesbrough, 1998).

Identification of parasites

All adult worms were identified directly under the microscope. The identification keys of Soulsby (1982) and Khali *et al.*

(1994) were adapted. The ova and helminthes from all the method mentioned above were identified using the helminthological keys earlier described (Soulsby, 1982; Urquhart *et al.*, 1996).

Parasitological technique for worm

Trematodes and cestodes were placed in a dorsoventral position on a slide. Another slide was placed over the worm and pressed gently until desired flattening was reached. At this stage, the two ends of the sides was tied together with a thread and then the whole material was put in 5% formalin for fixation for 48 hours. Then it was removed from the formalin, thoroughly washed in water and then it was put in the Acetic Alum Carmine stain (1:7) for 3 days. Then the worms were removed from the stain and distained with 1% acid alcohol to remove excess stain. The worms were immediately washed in running tap water to remove acid alcohol (Bluing). The stained parasites were then dehydrated in ascending grades of alcohol (70%, 90% and absolute alcohol). Then the worms were cleared in carbolic acid and then the worms were mounted in Canada balsam and examined under low or high power.

The nematode worms were washed well in water to the preservative. Then the worms were dehydrated in ascending grades of alcohol (70%, 90% and absolute alcohol). The nematodes were cleared in lacto phenol and then the worms were mounted in Canada balms and examined under low or high power. Worms were identified with keys provided by (Soulsby 1982).

RESULTS

In the present study 40 Native (Domestic) chickens (*Gallus gallus domesticus*) were screened for the presence of gastrointestinal helminth parasites. Among 40 birds screened all the chickens were found positive of gastrointestinal helminth parasites by gross examination of gastrointestinal tract. The results are given in Table 1&2, Figure 1&2.

Overall Prevalence of Parasites

Out of 40 Native chicken studied 31 (77.5%) were found positive of cestodes parasites and (22.5%) were found positive for nematodes parasites (Table 1 and Figure 1).

Prevalence of Cestode Parasites

The prevalence of cestode parasite are given in Table 1 and Figure 1. Out of 40 Native chicken studied 12 birds were found positive of *Raillietina tetragona* (30%) cestode parasite, 8 birds were found positive of *Raillietina echinobothrida* (20%) cestode, 6 birds were found positive of *Raillietina cesticillus* (15%) cestode, 3 birds were found positive of *Contugnia dgonophora* (7.5%) cestode and only 2 birds were found positive of *Hymenolepis carica* (5%) cestode. The results are given in Table 1 and Figure 1. Cestode parasites are group of worms, which possess an elongated tape like body (therefore, known as tapeworm) and lack an alimentary canal. Thus, the body covering or regiment serve not only as a protective coating but also as a metabolically active layer through which nutritive materials are absorbed, and secretions and waste materials are transported.

A parasite is considered to be an organism, which is intimately associated with another organism, the host, and in also directly or indirectly metabolically dependent on the host. Dependence of a parasite on the host for its food materials is of little importance unless it can utilize the food thus obtained. Adult tapeworms can probably only utilize molecules small enough to be taken in through their tegument and are therefore largely dependent on their host's ability to break down carbohydrates, fats and proteins. Lipids play an important role in the long term adaptation and completion of life cycle during their endoparasitic stage. Cestodes have lost their capacity for de novo synthesis of lipids and have become entirely dependent on the host. It is reported that the cestodes are able to absorb both short and long chain fatty acids through a mixture of diffusion and mediated transport. The lipid content of cestodes may vary considerably even in the same species grown in the same host species fed on different diets. This is related to the fact that host intestinal fatty acids and sterols are directly (i.e. without further digestion) absorbed by cestodes and the qualitative composition of cestode lipids generally follows that of the host. The lipid content can also vary with age of the proglottid.

Prevalence of Nematode Parasites

The prevalence of Nematode parasite are given in Table 1 and Figure 1. From the Table and Figure it is clearly understood that out of 40 Native chickens studied 9 birds (22.5%) showed positive of Nematode parasites. Out of 40 birds 5 birds (12.5%) were found positive of *Ascaridia galli* (12.5%) 4 birds (10%) were found positive of *Heterakis gallinarum* Nematodes. The results are given in Table 1 and Figure 1. *Ascaridia galli* is one of the largest nematode of the small intestine of birds. It may cause reduction in growth rate, weight loss, sometimes serious illness, pathological lesions and especially economical losses in native birds such as hens, turkeys, geese and some other birds. Also, damage to the intestinal mucosa leading to blood loss and secondary infection and occasionally the obstruction of small intestine of poultry due to high worm burden may occur. Parasitic nematodes are the most significant helminthes in terms of numbers of species and distribution, causing many serious diseases in humans and animal. Furthermore, they have a great economic impact on many agricultural products. (Soulsby, 1982).

Worm Burden in Native Chicken

Cestodes

The cestode worm burden in Domestic (Native) chickens are given in Table 2 and Figure 2. Out of 40 chickens observed 12 birds showed 16 number of *Raillietina tetragona* cestode parasite in the gastrointestinal tract of each bird, so totally around 192 *Raillietina tetragona* cestode parasite were observed in 12 Country chicken. Next to this 8 birds showed 14 number of *Raillietina tetragona* cestode parasite in the gastrointestinal tract of each bird, totally around 112 *Raillietina tetragona* cestode parasites were found in the gastrointestinal tract of 8 Native chicken. Out of 40 Native chickens studied 6 birds showed only 2 number of *Raillietina cesticillus* cestodes parasite in the gastrointestinal tract of each bird, so totally around 12 *Raillietina cesticillus* cestode parasite were observed in the gastrointestinal tract of 6 country chicken.

Table 1. Overall prevalence of Gastrointestinal Parasites of Native Chicken

Name of the Parasite	Number of Chicken Examined	Number of Chicken Infected	Prevalence%
Cestotodes			
1. <i>Reillietina tetragona</i>	40	12	30%
2. <i>R. echinobothridia</i>	40	08	20%
3. <i>R.cesticillus</i>	40	06	15%
4. <i>Cotugnia dgonophora</i>	40	03	07.5%
5. <i>Hymenolepis carioca</i>	40	02	5%
Total	40	31	77.5%
Nematodes			
1. <i>Ascaridia galli</i>	40	05	12.5%
2. <i>Heterakis gallinarum</i>	40	04	10%
Total	40	09	22.5%
Grand Total	40	40	100%

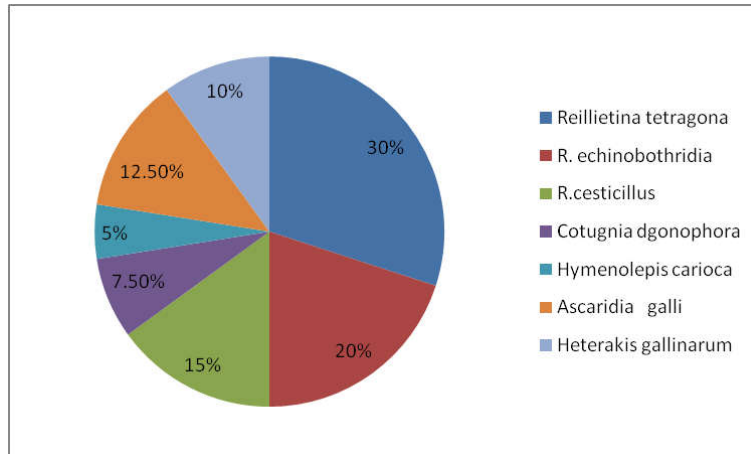
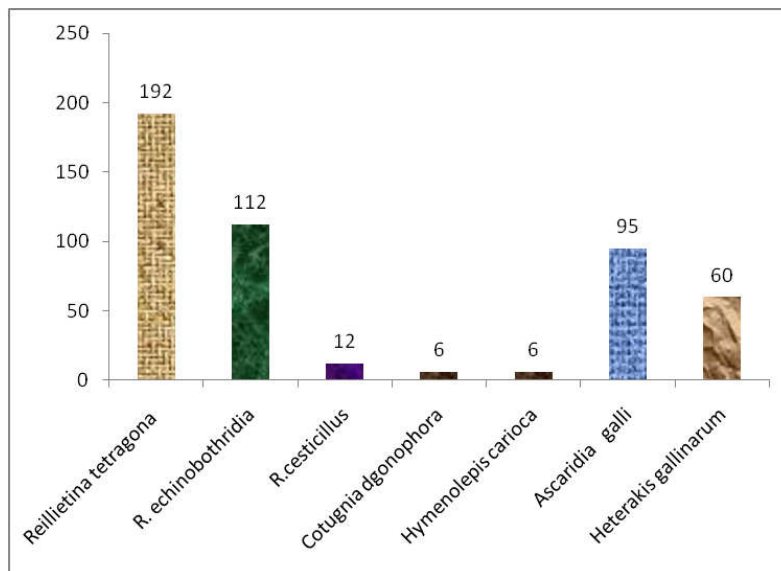


Table 2. The worm burden of Gastrointestinal parasites of Native chicken

Name of the Parasite	Number of Chicken Parasites	Number of Chicken Infected	Number of Parasite per chicken
Cestotodes			
1. <i>Reillietina tetragona</i>	192	12	16
2. <i>R. echinobothridia</i>	112	08	14
3. <i>R.cesticillus</i>	12	06	02
4. <i>Cotugnia dgonophora</i>	06	03	02
5. <i>Hymenolepis carioca</i>	06	02	03
Total	328	31	37
Nematodes			
1. <i>Ascaridia galli</i>	95	05	19
2. <i>Heterakis gallinarum</i>	60	04	15
Total	155	09	34
Grand Total	583	40	71



On the other hand 3 birds only 2 number of *Contugnia dgonophora* cestode parasite in the intestinal tract of each bird, totally around 6 *Contugnia dgonophora* parasites were found in 3 birds. Finally 2 birds showed only 3 numbers of *Hymenolepis carioca* cestode parasite found in the gastrointestinal tract of each bird. So totally around 6 *Hymenolepis carioca* cestode parasite were found in 2 birds. The results are given in Table-2 and Figure-2.

Nematode

The Nematode worm burden of gastrointestinal parasites of Domestic (Native) chicken, the results are given in Table-2 and Figure-2. From the Table, Figure and Plate, out of 40 Country chicken studied 9 birds showed infection of nematode parasites on the gastrointestinal tract. Out of 40 birds 5 chickens showed 19 *Ascaridia galli* nematode parasites on the gastrointestinal tract, so totally around 95 *Ascaridia galli* were found in the gastrointestinal tract of 5 birds. Finally 4 birds were showed 15 number of *Heterakis gallinarum* nematode parasite on the gastrointestinal tract, so totally around 60 *Heterakis gallinarum* were found in the gastrointestinal tract, so totally around 60 *Heterakis gallinarum* were found in the gastrointestinal tract of 4 Native chicken. The results are given in Table-2 and Figure-2. The results are in agreement with those of Puttalakshamma *et al.*, (2008) they studied 100 desi and 100 farm birds for the presence of gastrointestinal parasites. They found out of 100 desi birds 71 were found positive gastrointestinal parasites. Out of 71 positive desi birds, 35 (52.7%) were found positive for cestodes, 23 (34.3%) were found harbor nematodes and remaining 13 (18.3%) had showed mixed infection. But there were no adult helminthes and helminthes ova were observed in farm birds. But the gut contents showed *Eimerian* Oocytes in 10 birds out of 100 birds by microscopic examination.

DISCUSSION

Raillietina is the name a genus of tapeworm that includes helminth parasites of vertebrates mostly of birds. *Raillietina tetragona*, *Raillietina cestificillus* are the most important species in terms of prevalence and pathogenicity among wild and domestic birds. The level of their infection and clinical pathogenicity of characteristic of each species. *Raillietina cestificillus* is quite harmless interms of symptoms; whereas *Raillietina echinobothridia* is highly pathogenic and causes nodular tapeworm disease under heavy infection. Under severe infection, stunted growth and decreased egg production, resulting in loss of meat and egg production are experienced. Chronic infection results in diarrhoea, emaciabirn and anacmia, indicated cells, enteritis and macrophage infiltration of lymphocyte (Kauf mann 1996, and Bhowmik *et al.*, 1985). *Ascaridia galli*, *Ascaridia compare*, *Ascaridia dissimillis* and *Ascaridia columbae* are nematodes that occur in the small intestine of poultry. They can cause haemorrhagic enteritis. Heavy infections cause partial or total obstruction of the duodenum/jejunum. Adult *Ascaridia galli* are Semi-transparent, have three prominent lips in their oral openings and are the biggest nematodes found in poultry. *Ascaridia* causes anorexia, diarrhoea, dehydrhon stunted growth, unthriftiness, dropping wings, ruffled feathers, weight loss, reduced feed consumption rates, changes in behavior, dullness, lethary and misshapened and soft thin shelled eggs in poultry. The nematode *Ascaridia galli* is one of the most pathogenic and economically important parasites of poultry.

The adult affect the small intestine of the hosts feeding on digested food materials. Its control costs million dollars annually. The domestic feed on a wide range of diets, a habit that predispose them to parasitic infection (Frantoro, 2000). In addition the prevalence of some cestodes in the gastrointestinal tract e.g *Ratillietina tetragona* could be attributed to their fairly developed digestive system which given them greater chances of establishing a host – parasite relationship. The presence of certain condition especially moisture appears to favour the high infection rates with worms particularly those with a direct life cycle (Kennedy 1975; Audu *et al*, 2004). The heavy worm load in the gastrointestinal tracts of the birds might be due to continuous ingestion of infested droppings or infested intermediate hosts of organisms such as beetles, cockroach's, earthworms, flies and grasshoppers that are readily available to them in poorly managed stocks (Abdu 1986. and Majaro 1993).

Traditional poultry production is often described as a low input/ low output system and small flocks are left scavenging around to obtain their food. Low productivity is mainly caused by diseases including parasitic diseases, suboptimal management, and lack of supplement feed (Panday, *et al*, 1992). The results indigated that 5 species of cestodes (77.5%) *Raillietina tetragona*, *Raillietina echinobothridia*, *Raillietina cestificillus*, *Cotugnia dgonophora* and *Hymenolepis carioca* (77.5%) and 2 Species of nematodes (22.5%) *Ascaridia galli* and *Heterakis gallinarum*, were the most prevalence species in the gastrointestinal tract of native chicken. The majority of parasites reported in the presebt study fould be potentially pathogenic for poultry by inducing enteritis, ulceration or granuloma followed by anorexia, depression, emaciation and death (Permin *et al*, 1997). They also reported that the infection with *Ascaridia galli*, *Capillaria* spp, and *Raillietina echinobothridia* were cause, sever pathological lesions and death.

The results of this study showed a wide range of parasitic infection among village or Native chicken in the Cheyyar area. The prevalence of helminth parasite (Cestode and Nematode) in the gasatrontestinal tract of native chicken are in agreement with those of previous studies (Adene and Dipeolu 1975 and Bishop 1942). The prevalence of endoparasites cells for urgent attention to their prevention and control. Prevalence of 77.5% of cestode parasites of helminth in Native chicken and 22.5% of nematode parasites of helminth in native chicken may account for major productivity losses such as mortalities, reduced growth, and reduced size at maturity, poor egg lay and feed efficiency these are the common clinical symptoms of these parasites in native chicken (Ruff, 1999; Nadakal and Nair, 1979). Helminth parasites are more prevalent in Ghana and Janazania reported by many authors (Irungu *et al.*, 2004; Poulsen *et al*, 2000). The prevalence of the various helminth species in the present study agrees with those of earlier investigations (Fabiya, 1972). 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 (Nnadi *et al.*, 2007). These are known common characteristics of village chickens. The presence of the cestodes, nematodes are note worthy because of its association with ha3morrhagic enteritis which could Complicate anaemia of ectoparasite origin. There were also many cases of mixed helminth infestation. Country chicken satisfy their food requirements by scavenging habits and they usually seek their food in the superficial layers of the soil,

drains etc. which contain insects that may act intermediate hosts / vectors for cestodes (Pandey 1992; Permin *et al*, 1997). Moreover the development of these insects is also favoured by epizootiological determinants was responsible for a relatively higher prevalence of Raillietina spp. Infection in comparison to earlier findings (Pattalakshamma *et al*, 2008). The number of helminthic species observed in the present study was lower than those reported earlier by Kulkarni *et al*, (2001) that might be attributed to the short period of the study as well as the study was conducted in a limited area. Raillietina tetragona emerged as the most prevalent helminth spp (30%) in the Cheyyar region with Raillietina echnibothridia (20%) Raillietina cesticillus (15%) Cotugnia dgonophora (7.5%) and Hymenolepis carioica (5%). The prevalence of nematodes (Ascaridia galli and Heterakis gallinarum) in this study lower than that of documented by Kulkarni *et al*, (2001) from Maharashtra region and could be attributed to the difference in the ecology of the study areas. The ambient temperature and rainfall in Cheyyar region favourable epizootiological determinants for faster development and propagation of the different stages of nematodes. The present study revealed high prevalence of parasitic infection in Native chicken slaughtered in Cheyyar taluk, Thiruvannamalai District which could serve as a silent source of economic loss to the poultry industry through reduced productivity. Therefore more attention should be focused towards the improvement of the management and care of free ranging native chicken by deworming.

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