



UNIVERSITI PUTRA MALAYSIA

**A STUDY OF INTERNAL PARASITES IN FREE RANGE TURKEYS IN
SIMPANG RENGAM FARM, JOHOR, MALAYSIA**

ASHNITA SHIVANI PRASAD

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FPV 2018 10**

**A STUDY OF INTERNAL PARASITES IN FREE RANGE
TURKEYS IN SIMPANG RENGAM FARM, JOHOR,
MALAYSIA**

The logo of Universiti Putra Malaysia (UPM) is a shield-shaped emblem. It features a red and white design with a central vertical element and a book at the top. The letters 'UPM' are prominently displayed in a red box at the top left of the shield.

ASHNITA SHIVANI PRASAD

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Faculty of Veterinary Medicine, Universiti Putra Malaysia
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CERTIFICATION

It is hereby certified that we have read this project paper entitled “A STUDY OF INTERNAL PARASITES IN FREE RANGE TURKEY IN SIMPANG RENGAM FARM, JOHOR, MALAYSIA ”, by Ashnita Shivani Prasad and in our opinion it is satisfactory in terms of scope, quality, and presentation as partial fulfilment of the requirement for the course VPD 4999 – Project.

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DEDICATION

I bow down in prayer to the presiding deities of learning and wisdom Mata Saraswati
and Lord Ganesha for their unquantifiable blessings and approval,

The love of my life, my parents

(Sohan Prasad & Anita Prasad),

My beloved siblings

(Anushita Shayani & Shahil Anushkar),

My friends,

And to all my lecturers for lending a helping hand, their advice, support and continuous
encouragement throughout the development of this thesis project.

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LIST OF ABBREVIATIONS

Epg	Egg per gram
Opg	Oocyst per gram
G	Gram
%	Percentage



ABSTRAK

Abstrak daripada kertas projek yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan kursus VPD 4999- Projek Ilmiah Tahun Akhir

KAJIAN PARASIT DALAM DALAM AYAM BELANDA SISTEM BEBAS DI LADANG SIMPANG RENGAM , JOHOR, MALAYSIA

Oleh

Ashnita Shivani Prasad

2018

Penyelia: Dr Lokman Hakim Idris

Penyelia Bersama: Dr Nur Mahiza Md Isa

Pembelaan secara lepas bebas adalah sebahagian daripada perladangan ayam turki di negara membangun. Ayam turki dibesarkan dengan cara pembelaan secara bebas lebih senang untuk beradaptasi di luar. Terdapat beberapa laporan yang terhad tentang parasit dalaman dalam pembelaan ayam turki secara bebas di Malaysia. Laporan ini disediakan untuk membuat kajian tentang parasit dalaman di pembelaan secara bebas ayam Turki di Malaysia dari ladang Simpang Renggam, daerah kluang, Johor. Sejumlah 5 sampel darah, 5 sampel tinja dan 5 sistem penghadaman telah dikumpul dari ayam turki betina dan pelbagai parasit telah dikenalpasti. Parasit darah yang dijumpai di dalam ayam turki

adalah *Leucocytozoon spp.* dan *Plasmodium spp.* sebanyak 1(20%) dan 2(40%). 3 lagi spesies yang telur tinjanya sudah dijangkiti adalah *Eimeria spp* 3(60%) diikuti *Heterakis gallinarum* 2(40%) dan *Capillaria sp* 1(20%). Untuk cacing sistem penghadaman pula, *Capillaria spp* dijumpai di dalam ayam 20%. *Acanthocephalon* juga ada sebanyak 2(40%). Secara umumnya, kelima-lima ayam betina 2(40%) telah terjangkit dengan parasit darah dan 4 (80%) terjangkit dengan parasit sistem penghadaman. Kajian ini adalah yang kedua dalam menyediakan informasi berkenaan parasit dalaman dalam ayam turki di Malaysia. Informasi ini membantu pengkaji dan veterinarwan untuk membina strategi rawatan dan kawalan.

Kata kunci: ayam turki, pembelaan secara bebas, parasit darah, sampel tinja, sistem penghadaman, telur, Malaysia

ABSTRACT

Abstract of the project paper presented to the Faculty of Veterinary Medicine in partial requirement for the course VPD 4999 – Final Year Project.

A STUDY OF INTERNAL PARASITES IN FREE RANGE TURKEYS IN SIMPANG RENGAM FARM, JOHOR, MALAYSIA

By

Ashnita Shivani Prasad

2018

Supervisor: Dr Lokman Hakim Idris

Co-Supervisor: Dr Nur Mahiza Md Isa

Free range rearing is an integral part of turkey farming in most of the developing countries of world. Turkeys raised in free-range system are free to live and browse outside. Very scarce reports regarding internal parasites on free ranging turkeys are available from Malaysia. The present research project was designed to study internal parasites in free-range turkeys in Malaysia from Simpang Renggam Farm, Kluang District, Johor. A total of 5 blood samples, 5 faecal samples and 5 gastrointestinal tract specimens were collected from the female turkeys and different parasites were identified. The blood parasites found in turkeys were *Leucocytozoon spp* and *Plasmodium spp* at 1 (20%) and 2 (40%). Three species of faecal oocyst/egg infected the turkeys. *Eimeria spp* had the highest prevalence of 3(60%) followed by *Heterakis gallinarum* 2(40%) and *Capillaria sp* 1(20%). For the

gastrointestinal worms, *Capillaria spp* worm were found in one turkey at 20%. *Acanthocephalan* worms had the prevalence of 2(40%). Generally, of these 5 female birds, 2 (40%) were infected with blood parasites and 4(80%) were infected with gastrointestinal parasites. The study is second in its nature in providing the valuable information regarding endoparasites in turkeys from Malaysia. This information will essentially be helpful for the researchers and local veterinarians to develop strategies for both treatment and control of these endoparasites affecting turkeys.

Keywords: turkey, free range, internal parasites, blood parasites, faecal samples, gastrointestinal tract, oocyst, egg, Malaysia

1.0 INTRODUCTION

Poultry is one of the fastest growing agricultural sectors. The poultry industry provides meat that is preferred by almost all cultures, is affordable and of good quality. In Malaysia, the poultry farming business has been in existence for a long time. (Ariffin, Mohtar, & Baluch, 2004) Poultry production specifically includes chickens, ducks, guinea fowl, turkey and ostrich. Turkey and chicken productions however make up the main component of the commercial poultry.

Commercial turkey farming is a profitable business idea. Turkeys are native to North America. They are a type of poultry that belong to the order *Galliformes*, along with chickens. There are two species of wild turkey: the North American Wild Turkey (*Meleagris gallopavo*) and the Central American Ocellated Turkey (*M. ocellata*). Global turkey meat production is about 5.7 m tonnes/year.(Poultry Hub, 2018) Turkey grows faster like broiler chickens and become suitable for slaughter purpose within a very short time.

Turkey meat is less consumed in Malaysia compared to western countries such as Europe and United States. Most people eat broiler chickens that are available in many places and the price is more reasonable than turkey meat. Normally, turkey meat is sold at RM25 to RM30 per kg on average in some poultry farm.(Suhaila & Khadijah, 2017). In addition, the lack of awareness makes turkey meat not popular as a delicacy or dish.

Turkey parasites commonly seen include protozoa, helminths and arthropods. Parasitic infections have a negative impact on production whereby it decreases the growth rate and increases mortality. It is obvious that poultry maintained under free-range conditions may be heavily parasitized due to the fact that they scavenge in the farm area.

Bird blood parasites (avian haematozoa) can cause disease and death of their hosts. It is likely that all species within the genera *Haemoproteus*, *Plasmodium* and *Leucocytozoon* are harmful to a greater or lesser degree, depending the range of hosts they can infect, environmental stress, age, nutrition and the availability of suitable insects (vectors) to transmit disease between birds.(Queensland Museum, 2018)

Worms are extremely common, particularly in free-range poultry. Eggs/oocyst or larvae in faeces can indicate the presence of parasitic infection and facilitate the diagnosis of parasitic disease. Many parasites use a range of bird species as definitive hosts. These parasites can have serious pathological effects on birds, inducing high mortality rates during peaks of infection.(Colin Walker, 2015)

Parasitism causes tremendous loss in poultry production. After a disease has once gained a foothold in a flock, far more time and money are usually spent in getting rid of the disease than would have been necessary to keep the premises free of it. Poultry raisers are demanding more and better control measures for both parasites and diseases.

Free range and scavenging behaviour of turkey's increases exposure to soil and intermediate host, which may lead to parasitic infection. Very limited study had been done on parasitism in free-range turkeys in Malaysia.

Therefore, this study was undertaken to fulfil the following objective:

- To identify internal parasites harboured by free-range turkeys in Malaysia (Simpang Renggam Farm).

For this research, the following hypothesis was proposed:

- There are potential internal parasites harboured by free range Turkeys in Malaysia (Simpang Renggam Farm).



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2.0 LITERATURE REVIEW

2.1 Avian Blood Parasites

2.1.1 *Haemoproteus spp*

Haemoproteus spp is the most common blood parasite in birds. More than 120 species have been reported in free-living ducks, quail, and turkeys but are rare to absent in commercial flocks, probably because of limited vector exposure or very specific feeding habits of *Culicoides spp* and *hippoboscid* flies, the invertebrate vectors.(Arnaud J. Van Wettere, 2018a)Experimental infection in turkeys with *H meleagridis* resulted in lameness, diarrhoea, anorexia, and depression.(Arnaud J. Van Wettere, 2018) *Haemoproteus* infections have very rarely been incriminated as a cause of death, although in stressed or immunocompromised birds a severe infection can result in haemolytic anaemia, anorexia and depression.(Yildirim et al., 2013).

2.1.2 *Leucocytozoon spp*

Leucocytozoon's life cycle involves an intermediate host (the blackfly) which carries the parasite from one avian host to another. According to a study carried out in southwest of Iran, 8 turkeys out of 275 domestic birds were positives for *Leucocytozoon*. (Dezfoulian et al., 2013). Outbreaks of leucocytozoonosis caused by *L smithi* have been reported in turkeys in North America. Clinical disease and mortality result from anaemia caused by antierythrocytic factors produced by the parasite. Affected turkey poults are listless and show various combinations of the following signs: anaemia, leucocytosis, tachypnea, anorexia, diarrhoea with green droppings, and CNS signs. Mortality is low in adult turkeys.(Arnaud J. Van Wettere, 2018)

2.1.3 *Plasmodium spp*

Plasmodium spp use mosquitoes as vectors. Thirty-five species of *Plasmodium* are considered valid species. *P gallinaceum*, *P juxtannucleare*, and *P durae* are the most pathogenic species found in poultry in Asia and Africa. *P durae* infects turkeys and the mortality can approach 100% (Arnaud J. Van Wettere, 2018). If the parasite load is sufficiently high, the bird begins losing red blood cells, causing anaemia, which can lead to progressive weakness and, eventually death.(Arnaud J. Van Wettere, 2018b)

2.2 Avian Endoparasites (Faecal egg/oocyst & Gastrointestinal worms)

2.2.1 *Eimeria spp*

Coccidiosis is an important disease turkey caused by protozoan parasites of the genus *Eimeria*. The parasite is widespread in turkey flocks and capable of causing considerable economic loss. (NADIS, 2018)It destroys the cells lining the gut wall leading to intestinal damage. The degree of damage will depend on how many coccidial eggs (oocysts) are eaten, which in turn will depend upon how contaminated the environment is with oocysts. The prevalence of *E. meleagrimitis*, *E. gallopavonis*, *E. meleagridis*, *E. dispersa*, *E. innocua/subrotunda*, *E. adenoeides*, and an undescribed species in pen-raised wild turkeys was said to be 97%, 47%, 27%, 17%, 13%, 7% and 3%, respectively.(Chapman, 2008) Highest count of *Eimeria* oocyst were found from turkeys in Jabatan Perkhidmatan Veterinar Daerah Pendang, Kedah with 7300 epg .(Suhaila & Khadijah, 2017)

2.2.2 *Capillaria spp*

Adult *Capillaria* are very thin, "threadlike" nematodes that are approximately 1 cm (0.39 in) long. Their eggs, which can only be seen using a microscope, are barrel-shaped and have clear pugs on each pole.(PoultryDVM, 2018). According to a study done in

randomly selected turkeys slaughtered in Bukuru – Jos metropolis, Nigeria, the prevalence of *Capillaria* species was 20.50% which were found in the oesophagus and small intestine (Dauda et al., 2016) In Malaysia, *Capillaria spp.* were found from turkeys in Jabatan Perkhidmatan Veterinar Daerah Pendang, Kedah with 1200 epg .(Suhaila & Khadijah, 2017)

2.2.3 *Ascaridia spp*

Ascaridia galli are the largest nematodes found in poultry. Adult worms live in the lumen of the small intestine and grow up to 12cm long.(Johnston, 2011) A study on the prevalence of gastrointestinal parasites of domestic turkey (*Meleagris gallopavo*) was carried out in Kaduna metropolis, northern Nigeria revealed that parasite with the highest prevalence was *Ascaridia spp* at 26.0%.(Udoh, Luka, & Audu, 2011)

2.2.4 *Heterakis spp*

Heterakis gallinarum, rarely causes direct problems in Turkey. At approximately 1cm to 2cm in length, these adult worms are visible to the naked eye in the host's caecal contents. The main economic effect of *Heterakis* infection lies in its role as a carrier of protozoan parasite *Histomonas meleagridis*. This organism can cause high levels of mortality in turkeys – a condition known as blackhead.(Johnston, 2011) The intestinal nematode *Heterakis gallinarum* appeared with a prevalence of 70% in the infected Brazilian turkeys, without gross lesions when not associated to the protozoan *Histomonas meleagridis*.(Brener et al , 2006)

3.0 MATERIAL AND METHOD

3.1 Sampling Area

Simpang Renggam is a town in Kluang District, Johor, Malaysia. The farm is located in a rural area, which was mostly accessible using motor bikes due to poor road conditions caused by rainy season.

Currently, the farm holds about 90 turkeys, which are managed in a free-range system. The breeds kept at the farm are American Bronze, Royal Palm, Narragensett and Bourbon Red. Turkeys are fed once daily with Napier grass, corn, rice straw and pellet. The market age is around six months and certain birds are used as breeders at 9 months. Pullorum and coccidiosis mostly infects the birds. In addition to that, Blackhead disease had occurred and metronidazole was administered. No vaccination or deworming is being practised at the farm. Mortality mostly arises due to fighting.

Five free-range female turkeys were randomly chosen from the Simpang Renggam farm in order to collect the blood and faecal samples. All fowls were slaughtered using Halal – slaughtering method and the gastrointestinal tract was collected.

In order to obtain results of parasite occurrence, prevalence was calculated. As stated by Thrusfield, prevalence, P, is the number of instances of disease or related attributes (e.g., infection or presence of antibodies) in a known population, at a designated time, without distinction between old and new cases. When the time is not specified, prevalence usually refers to point prevalence; that is, the amount of disease in a population at a particular point in time. (Thrusfield, 2005)

$$P = \frac{\text{number of individuals having a disease at a particular point in time}}{\text{number of individuals in the population at risk at that point in time}}$$

This research project was approved by the Institutional Animal Care and Use Committees (IACUC).



Figure 1: This picture was taken at the Simpang Renggam Farm showing free-range turkeys in the housing area within the farm.

3.2 Sampling Method

3.2.1 Blood Parasites Examination Procedure

Two millilitres of blood was withdrawn from the ulnar vein of the turkey and kept in Ethylenediaminetetraacetic acid (EDTA) tubes. The tubes were kept in an icebox for transportation and stored under 4°C in a refrigerator. Some blood was used for direct wet mount to observe for presence of *Microfilaria sp* and *Trypanosome sp*. Thin blood smear was performed for all 5-blood samples. A drop of blood was placed onto the slide and it was spread evenly with a coverslip held at 45-degree angle. The slides were allowed to

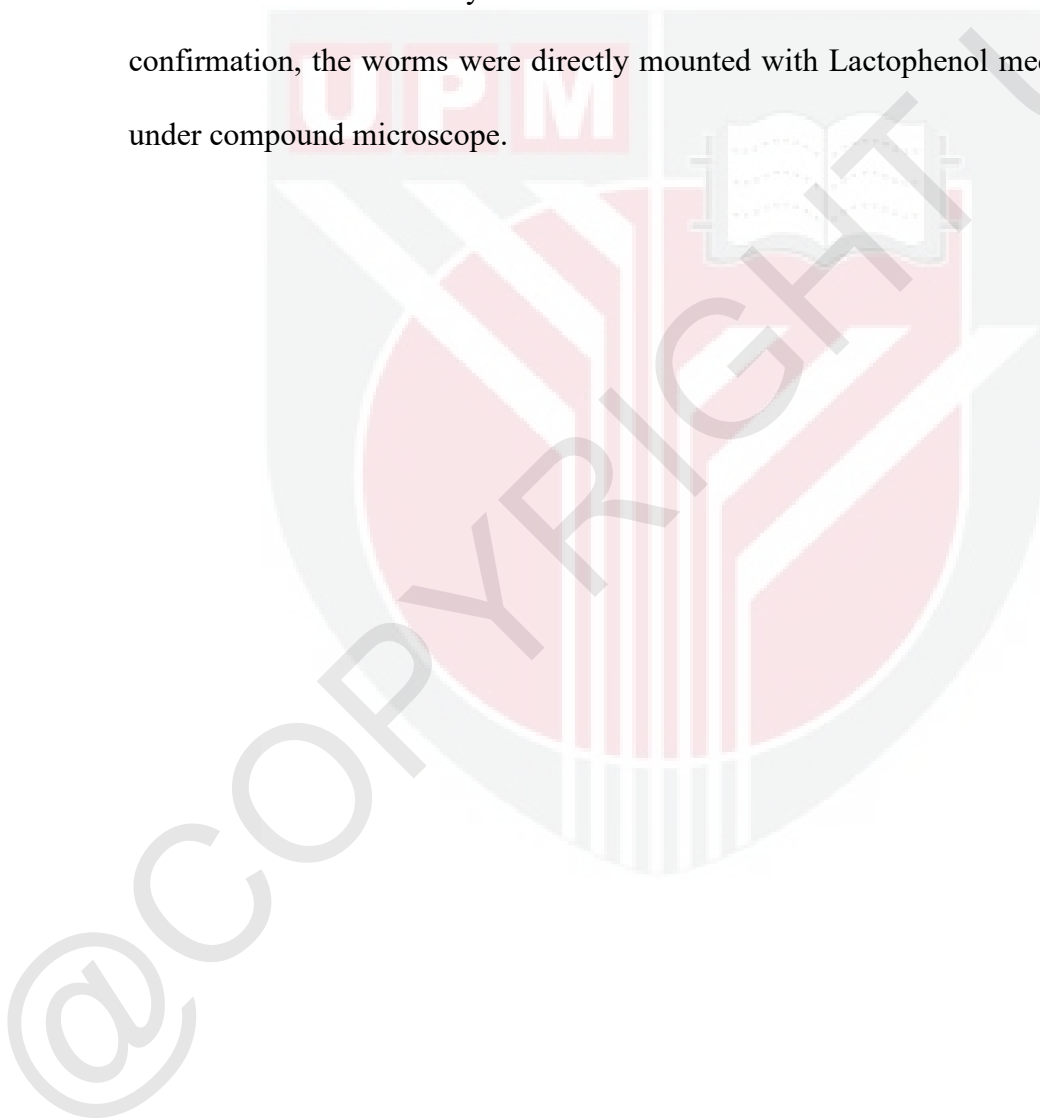
dry for 10 minutes before they were fixed with absolute methanol for 2 minutes in a coupling jar. Next, the slides were stained with Giemsa stain for about 35 minutes. The slides were then washed with tap water and placed in an upright position to air dry. After that, all the slides were examined under 100X oil immersion objective using a light microscope. This experiment was repeated in duplicates.

3.2.2 Faecal Examination Procedure

Random dropping faeces of turkey were collected at ten different spots using gloves. Two different dropping of faeces were combined in a clean plastic bag to become one sample. Thus, 5 samples of faeces from free range turkey were obtained and labelled accordingly. The samples were stored and transported in a Styrofoam icebox. Each sample was analysed using the McMaster technique to identify helminthic eggs and coccidia oocysts that were possibly present. Two grams of faeces from each sample was weighed and placed in 250 millilitres beakers. 30 millilitres of saturated sodium chloride (NaCl) solution was added into the beaker. The content was mixed thoroughly using a spatula. The faecal suspension was then filtered through a small tea strainer into another clean 250-millilitre beaker. At that time, the filtrate was stirred using the Pasteur pipette and sub-sample from the filtrate was withdrawn. Next, both compartment of the McMaster counting chamber was filled with the sub-sample. The counting chamber was allowed to stand for 5 minutes to allow the eggs to float to the surface and the debris to go to the bottom of the chamber. The sub-sample in the chamber was then examined under the compound microscope at 10 x 10 magnification. All eggs and oocysts within the grid area of both compartments were identified and calculated.

3.2.3 Gastrointestinal Worms Examination Procedure

Post mortem was performed on the five turkeys and the gastrointestinal tract was collected. The intestines were tied, transported in an icebox and stored under 4 °C in a refrigerator. These intestines were separately cut open using a dissecting Myoris scissors and soaked in normal saline. The worms were collected and preserved in 70% alcohol. The worms were directly examined and observed under a stereomicroscope. For confirmation, the worms were directly mounted with Lactophenol medium and viewed under compound microscope.



4.0 RESULTS

4.1 Prevalence of Haemoparasites in Turkeys from Simpang Renggam Farm

The prevalence of blood parasites in five turkeys from Simpang Renggam Farm is shown in **Table 1**. Two out of five turkeys were infected by blood parasites. *Plasmodium spp* had a higher prevalence among the blood parasites with 40% of the sample being affected. *Leucocytozoon spp* was found at of 20%. *Haemoproteus spp*, *Microfilaria spp* and *Trypanosome spp* were not detected in this study.

Table 1 : Prevalence of Haemoparasites in Turkeys from Simpang Renggam Farm

Parasite	T1	T2	T3	T4	T5	% (no.)
<i>Plasmodium spp</i>	/	/	X	X	X	40 (2)
<i>Leucocytozoon spp</i>	X	/	X	X	X	20 (1)

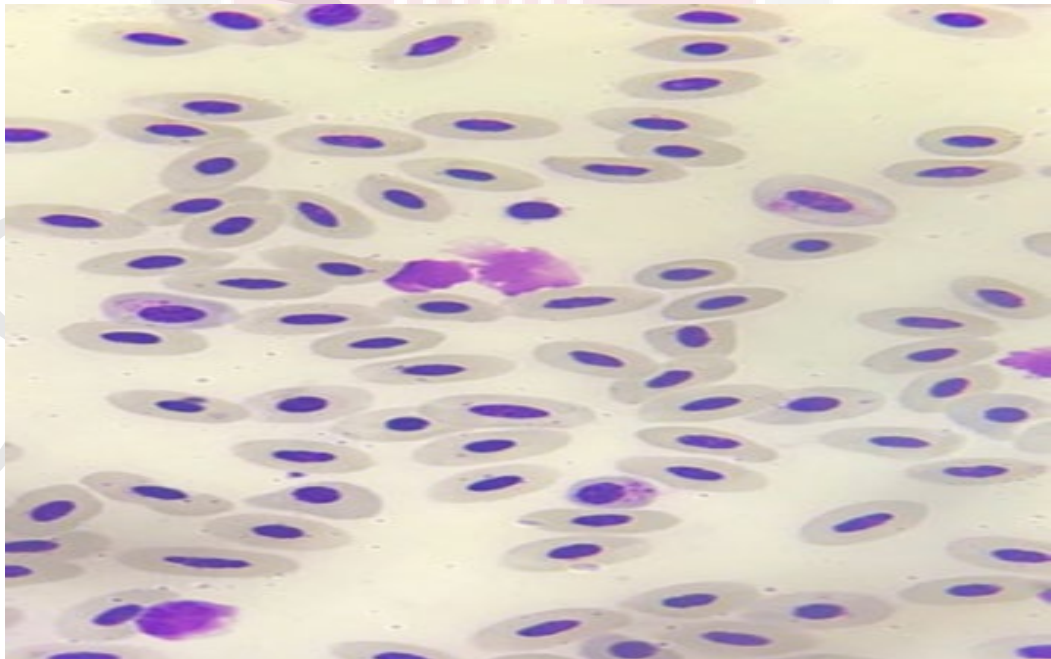


Figure 2: This picture shows the microscopic view of *Plasmodium spp*.

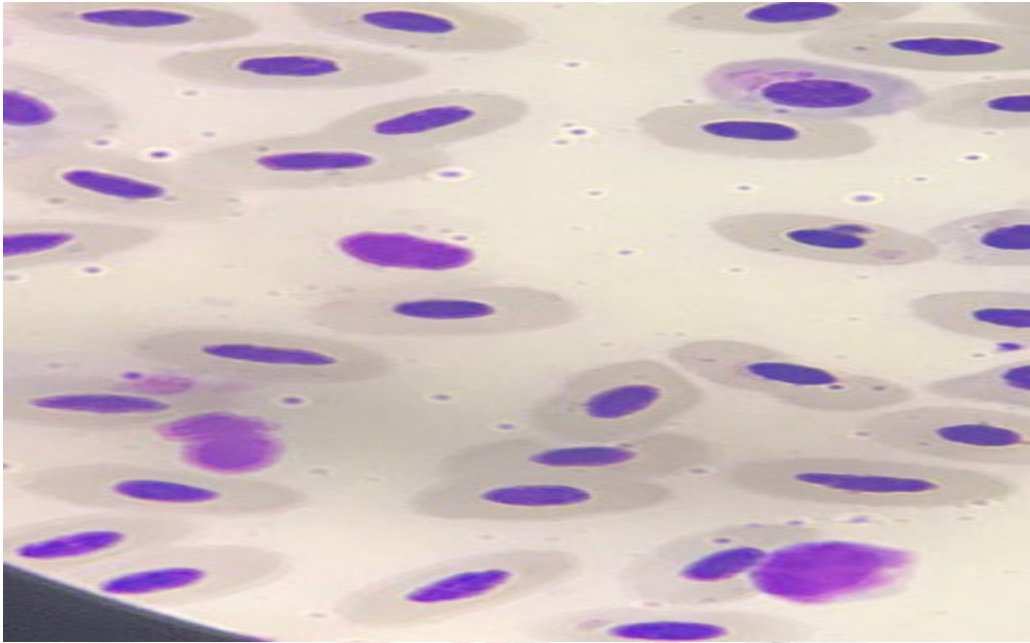


Figure 3: This picture shows the microscopic view of *Leucocytozoon spp.*

4.2 Prevalence of Gastrointestinal Parasites (Eggs) in Turkeys from Simpang Renggam Farm

The prevalence of faecal oocyst /egg in 5 turkeys sampled are shown in **Table 2**. *Eimeria spp* had the prevalence of 60%, which was the highest among the faecal oocyst/egg. *Heterakis gallinarum* was found at 40%. *Capillaria spp* had the prevalence of 20% while Raillietina spp was not detected at all.

Table 2 : Prevalence of Gastrointestinal Parasites (Eggs) in Turkeys from Simpang Renggam Farm

Oocyst/egg	T1	T2	T3	T4	T5	% (no.)
<i>Eimeria spp</i>	/	/	X	/	X	60 (3)
<i>Capillaria spp</i>	/	X	X	X	X	20 (1)
<i>Heterakis gallinarum</i>	/	X	X	/	X	40 (2)



Figure 4: This picture shows the microscopic view of oocyst/eggs of *Eimeria spp* and *Heterakis sp*.

4.3 Prevalence of Gastrointestinal Parasites (Adult worms) in Turkeys from Simpang Renggam Farm

The prevalence of intestinal worms in 5 turkeys are shown in table 3. *Acanthocephalan* was found at 40%, which means that 2 out of 5 turkeys carried the worm. *Heterakis gallinarum* was found in one turkey at 20%. *Ascaridia spp* was not found.

Table 3 : Prevalence of Gastrointestinal Parasites (Adult worms) in Turkeys from Simpang Renggam Farm

Parasite	T1	T2	T3	T4	T5	% (no.)
<i>Heterakis gallinarum</i>	X	/	X	X	X	20 (1)
<i>Acanthocephalan</i>	X	/	/	X	X	40 (2)

4.4 Comparison of Prevalence of Haemoparasites and Gastrointestinal Parasites in Turkeys from Simpang Renggam Farm.

Of the birds examined, 2 (40%) were infected with blood parasites and 4 (80%) were infected with gastrointestinal parasites.

Table 4 : Comparison of blood and GI Parasites in in Turkeys from Simpang Renggam Farm.

Bird Species	No.	% infected with blood parasites (no.)	% infected with GI parasites (no.)
Turkey	5	40 (2)	80 (4)

5.0 DISCUSSION

Internal parasites constitute a major impediment to efficient poultry production including turkeys, thereby leading to substantial economic losses.

Turkeys examined in this study were infected with *Plasmodium spp* (40%) and *Leucocytozoon sp* (20%). Turkeys studied in Owerri, South-eastern Nigeria showed *Plasmodium sp.* at 40%.(Opara, Osowa, & Maxwell, 2014) Eve et al stated that *Leucocytozoon smithi* was found in 100 percent of the films from adults and 77 percent of those from immature birds. (Eve, Kellogg, & Bailey, 1972)

Coccidiosis is a widespread disease of considerable economic importance to the turkey industry, as is evident by the fact that many millions of dollars are spent annually on its control (Chapman, 2008). In this study, out of all the internal parasites found, coccidian oocyst had the highest percentage. *Eimeria spp* had the prevalence of 80%. In keeping with the research done in Malaysia , oocyst of *Eimeria spp.* recorded the highest faecal egg count with 7300 epg (Suhaila & Khadijah, 2017).

Parasitic infections (nematodes, cestodes and trematode) often constitutes to low productivity and impairs the health status.(Hoghoghi et al, 2014). The fowls examined were infected with the nematodes, *Capillaria spp* and *Heterakis gallinarum*. This could be due to the reason that nematodes establish themselves in their hosts faster than the others trematodes and cestodes.(Hoghoghi Rad et al., 2014)Eggs (40%) and worms (20%) of *Heterakis gallinarum* were found from the faeces and intestinal tract samples. *Capillaria spp* (20%) eggs were only detected in the faeces. Pooled sampling of faeces was done, thus it cannot be said that which particular animal had the parasite eggs. Endoparasite screening of free-range turkeys done in Johor, Malaysia detected *Capillaria*

spp. with 1200 epg. (Suhaila & Khadijah, 2017). A previous study by Brener et al., reported that the intestinal nematode *Heterakis gallinarum* appeared with a prevalence of 70% in Brazilian turkeys (Brener et al., 2006). This worm often carries a protozoan parasite *Histomonas meleagridis*, which causes histomoniasis (blackhead disease) particularly in turkey. To prevent or at least reduce *Heterakis* infections, it is recommended to keep the birds bedding as dry as possible and to frequently change it, because development of the worm's eggs needs humidity. Strict hygiene of feeders and drinkers are necessary to avoid or reduce their contamination with eggs. Pasture rotation is also recommended. All these measures are especially important for young birds, particularly for turkeys, which are likely to suffer more from *Heterakis* infections. They are highly recommended in flocks with a history of histomoniasis. (Junquera, 2017)

Thorny-headed worms or *Acanthocephalan* was found in two out of five turkeys (40%) in this study. A wild turkey, *Meleagris gallopavo merriami*, shot in South Dakota, U.S.A., in 1958 harboured 3 female specimens of *Mediorhynchus grandis la* in the small intestine. This is claimed to be the first report of an acanthocephalid from wild turkeys (American Society of Parasitologist, 1914) None of the studies done on turkeys in Malaysia stated the presence of *Acanthocephalan*.

The occurrence of blood parasites of turkeys in this study was 40%. This result partially agrees with a study done in Owerri South-eastern Nigeria, which reported a prevalence of 40% among reared turkeys (Opara et al., 2014). This resemblance might be attributed to similar environmental conditions for the birds and parasites and management practices adopted by the farmers in these areas. The overall occurrence of gastrointestinal parasites of turkeys in this study was 80%. This does not agree with a research done by Opara et al., who reported a prevalence of 60% in free ranging turkeys (Opara et al.,

2014). Elsewhere, also revealed that 90% of the gastrointestinal tracts and faecal samples were found to be positive for parasites (Myles & Shehu, 2017).

The high occurrence rate of 80% in the turkeys suggest that there are favourable environmental conditions around the farm, which are necessary for coccidian oocyst/helminth eggs survival and high reproductive efficiency of these parasites. A study done in Kaduna metropolis revealed that raised domestic turkeys hosts a greater amount of gastrointestinal parasites, which attributed to the production system to which they belong. Therefore, turkeys raised in free-range condition of breeding should have a boundary and food served to them to reduce their search for food, which exposes them to intermediate hosts of parasites.

Several factors could have affected the incidence of internal parasites in Simpang Renggam Farm. Birds aged 52 weeks that were selected maybe more susceptible due to previous exposure of old birds to mild or moderate infection develops immunity against this parasite. Multi-age flocks practice by the owner may increase the occurrence of coccidiosis. The time at which samples were collected was during raining seasons and parasites are common at that time due to increasing relative humidity, which favours parasites occurrence. Coccidiosis can occur in wetter and humid weather as it is a favourable environment for sporulation of oocysts (Hagos et. al, 2004). Free range and scavenging behaviour of turkey's increases exposure to soil and intermediate host, which may lead to parasitic infection. No additional vitamins and mineral were provided to the reared turkeys. Vitamin K can be used in cases of severe coccidial infection. In addition, vitamin A and proteins can increase the resistance of the host against parasitic diseases. Some members of vitamin B complex (B1, B6 and biotin) have a role in the *Eimeria* life cycle, so deficiency of them increase the incidence of *Eimeria* infection.(El-ghany, 2016).

Poor hygiene practices can cause contamination and lead to coccidiosis. Deworming/vaccination and anticoccidial regimes were not practised on this particular turkey farm, which may cause coccidiosis.

Parasites are of economic importance as it can significantly diminish the profitability of a farm. Parasites may cause direct specific disease with serious loss (coccidiosis) or indirect disease conditions as fatal anaemia (El-ghany , 2016). Production is affected due to decrease in feed intake causing loss of body weight and drop in egg production leading to economical loss in a farm. Certain parasites transmit other parasites such as in turkeys, *Heterakis* eggs transmit *histominus* parasite which causes black head disease which is fatal causing loss of production animals.

6.0 CONCLUSION

This study showed that blood and gastrointestinal parasites infected turkeys reared in free-range system. Haemoparasites infected less turkey as compared to gastrointestinal parasites in the studied farm. The blood parasites found in turkeys were *Leucocytozoon spp* and *Plasmodium spp*. Three species of faecal oocyst/egg infected the turkeys: *Eimeria spp*, *Heterakis gallinarum* and *Capillaria spp*. *Heterakis gallinarum* and *Acanthocephalan* worms were found in the gastrointestinal tract.

7.0 RECOMMENDATIONS

It is best to use larger sample size to obtain reliable data. Other than that, different age and gender groups should be included to cover all fowls in the farm. In order to get better and accurate results, the number faecal samples tested should be increased. Diagnostic test such as PCR can be used to diagnose parasites at species level.



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