

## REARING SYSTEMS RELATED TO GASTROINTESTINAL PARASITES IN GOATS FROM SELECTED AREA IN TERENGGANU

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### Abstract

This study was the first attempt to compare the prevalence of gastrointestinal parasites in goats in three different rearing systems. A total of 287 fecal samples were randomly collected from goats in three farms in Terengganu, Malaysia. The samples were processed by using sodium chloride floatation method and observed microscopically. Out of 287 goats, 280 (97.6%) were infected with gastrointestinal parasites. Goats reared under the intensive rearing system reported the highest prevalence of infection (99%), followed by extensive rearing system (98.3%) and the lowest prevalence was reported in the goats reared under the semi-intensive rearing system (96%). The following gastrointestinal parasites were identified in goats in accordance of predominant: *Eimeria* spp. (89.2%), *Strongyloides* spp. (45.6%), *Strongyle* spp. (20.6%), *Moniezia* spp. (13.9%) and *Trichuris* spp. (8.4%). Three species showed predominant in goats under the semi-intensive rearing system were *Strongyle* spp., *Strongyloides* spp., and *Trichuris* spp. with the percentage of 33.1%, 83.1% and 10.5%, respectively. *Moniezia* spp. was the highest in goats under the extensive rearing system which occurred at 26.7%, whereby *Eimeria* spp. was predominant under intensive rearing system with the infection rate of 99%. The finding suggested that the rearing system might not influence the occurrence of GI parasites in goats. Further study should be conducted to validate this finding.

**Keywords:** Prevalence, gastrointestinal parasites, goats, intensive rearing system, semi-intensive rearing system, extensive rearing system, Terengganu

### Abstrak

Kajian ini merupakan kajian buat pertama kalinya bagi membandingkan prevalens parasit gastrousus yang diasingkan daripada kambing di bawah tiga sistem penternakan yang berbeza. Sebanyak 287 sampel tinja secara rawak telah diambil daripada tiga ladang kambing di Terengganu, Malaysia. Sampel telah diproses dengan menggunakan kaedah pengapungan natrium klorida dan diperhatikan secara mikroskopik. Daripada 287 kambing, 280 (97.6%) telah dijangkiti parasit gastrousus. Kambing dipelihara di bawah sistem penternakan intensif mencatatkan prevalens tertinggi jangkitan (99%), diikuti oleh sistem penternakan ekstensif (98.3%) dan prevalens yang paling rendah dilaporkan di dalam kambing yang dipelihara di bawah sistem penternakan separa intensif (96%). Parasit gastrousus berikut telah dikenal pasti di dalam kambing mengikut keutamaan: *Eimeria* spp. (89.2%), *Strongyloides* spp. (45.6%), *Strongyle* spp. (20.6%), *Moniezia* spp. (13.9%) dan *Trichuris* spp. (8.4%). Tiga spesies yang menunjukkan jangkitan paling tinggi di dalam kambing di bawah sistem penternakan separa intensif adalah *Strongyle* spp., *Strongyloides* spp., dan *Trichuris* spp. dengan peratusan 33.1%, 83.1% dan 10.5%, masing-masing. *Moniezia* spp. adalah yang tertinggi di dalam kambing di bawah sistem penternakan ekstensif yang berlaku pada 26.7%, di mana *Eimeria* spp. dijumpai tertinggi di bawah sistem penternakan intensif dengan kadar jangkitan sebanyak 99%. Hasil kajian menunjukkan bahawa sistem penternakan mungkin tidak mempengaruhi berlakunya jangkitan parasit gastrousus di dalam kambing. Kajian lanjut perlu dijalankan untuk mengesahkan penemuan ini.

**Kata kunci:** Prevalens, parasit gastrousus, kambing, sistem penternakan intensif, sistem penternakan separa intensif, sistem penternakan ekstensif, Terengganu

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## 1.0 INTRODUCTION

Malaysia is a country that has a rapid growth in livestock industry, especially goat. In 2014, the Federation of Livestock Farmer's Association of Malaysia (FLFAM) reported that the population of goat was estimated at 455,737 [1]. In addition, most of the gross national income in the country was contributed from goat farming [2]. Unfortunately, the occurrence of gastrointestinal (GI) parasites in goat has become a major threat to the industry. High prevalence of GI parasites can be found in goats especially in humid tropical and subtropical area [3]. The hot, wet and tropical climate throughout the year in Malaysia is favourable for the presence of GI parasites. GI parasites caused significant economic loss [4-5] due to high mortality [6] and limited production of milk and meat [2] in goats.

Goats were commonly infected with helminth and protozoa parasites [7]. These parasites infected goats through the ingestion of contaminated water or food [8] which eventually exhibit clinical signs including diarrhea, reduced weight, loss of appetite and stunted growth [9]. In Malaysia, three common types of goat rearing system are practiced by the farmers which are intensive, semi- intensive and extensive system. So far, there is still no study conducted in Malaysia to identify the GI parasites in goat with three different types of goat rearing system. Some literatures are available on the prevalence of GI parasites which focused on one or two types of rearing system only. Hence, this study was the first attempt to be conducted involving three types of rearing systems. According to Rabbi *et al.* [10] who study parasitism in Black Bengal goats, parasitic infection was more susceptible in goats reared under extensive rearing system.

Currently, helminthiasis has been claimed as the second most important cause of mortalities in goats, after pneumonia [11]. The most common GI helminthes that can be found in goats were *Strongyle* spp., *Strongyloides* spp., *Trichuris* spp., and *Moniezia* spp. [12-14]. Recently, a study done by Zainalabidin *et al.* [8] on 175 small ruminant samples from 7 farms in Perak, Malaysia showed that 152 fecal samples were positive for helminthiasis with the percentage of 86.86%. They also claimed that *Strongyle* spp. was the predominant species which similar to study done in Nigeria [15], Brazil [16] and Thailand [17].

Coccidiosis, a diarrhea disease caused by *Eimeria* spp. [18] is known as an economically important disease of livestock, mainly goat [19]. So far, nine species of *Eimeria* spp. have been identified in goats in Malaysia [20]. *Eimeria arlongi* was the most pathogenic species infected goats [21, 22]. The presence of *Eimeria* spp. infections has significantly increased the mortality rate in goats [23].

Therefore, the objective of this study was to compare the prevalence of GI parasites in goats in three different rearing systems. This study will provide useful information to the farmers on the best rearing

practices that can be applied in order to reduce the infection status in their farm.

## 2.0 METHODOLOGY

### 2.1 Ethic Statement

The present study was approved by the Department of Veterinary Services (DVS), Terengganu dated 18<sup>th</sup> May 2014 (ref JPV.TR 03/03/13). All the protocols during the specimen collection were carried out in accordance and recommendations by DVS, Terengganu.

### 2.2 Sample Area

The study was carried out in the state of Terengganu which is located in the north-eastern part of Peninsular Malaysia between February 2015 to May 2015. Three farms were selected from three districts in Terengganu which are Kuala Terengganu, Setiu and Besut which represent intensive, semi- intensive and extensive rearing system, respectively. The climates in the area are uniform temperature, high humidity and heavy rainfall between November to January [24].

### 2.3 Sample Collection

A total of 287 fecal samples were randomly collected from goats aged ranging from one year old up to four years old. Fresh fecal samples were collected directly from the rectum of goat with sterile plastic gloves and placed in a sterile container, labeled with identification number. The specimens were sent immediately to the laboratory in ice box. All samples were processed and analyzed at the Integrated Centre for Research Animal Care & Use (ICRACU) laboratory, International Islamic University Malaysia (IIUM), Kuantan, Pahang.

### 2.4 Rearing System

Three different types of rearing systems were selected which is intensive, semi- intensive and extensive system. For the farm where the farmer applied intensive rearing system, the goats are kept in the pen without going out to the grazing land. The major feed resources in the area are cut grass or concentrates or a mixture of cut grass and concentrates. Besides, the goats under intensive rearing system are constantly provided with feed, clean water and minerals. Meanwhile, the goats that are managed under semi- intensive rearing system are brought out to the grazing pasture during the day and housed during the night in sheltered pens. The goat will be grazed usually for 4-6 hours per day. Then, goats will be herded back to the pen for supplementary feeding and shelter. On the other hand, the goats under the extensive rearing system are allowed to graze on private owned pasture land without provision of supplementary feed. The goats usually grazed for about 6-9 hours per day.

## 2.5 Sample Processing

The fecal samples were examined using sodium chloride floatation technique [25] with a slightly modification. About 3g of fecal sample was measured and mixed with 20 mL of saturated sodium chloride solution. 3g of fecal sample was used instead of 1g as mentioned in the previous study to ensure more recovery of eggs and oocysts. The mixture was ground by using a mortar and pestle and sieved through a tea strainer. Mortar and pestle was used to completely emulsify the fecal and solutions instead of using stick. The filtered fecal suspension was poured into a 15 mL tube. A clean cover slip was placed on top of the tube and left undisturbed for 30 minutes to give time for the oocysts and eggs to float. The cover slip was carefully lifted from the tube and placed on a microscopic slide. The slides were observed microscopically using 10x and 40x magnification for the qualitative detection of helminth eggs and coccidian oocysts.

## 2.6 Statistical Analysis

Data was entered into Mc Excel® 2012 (Microsoft Corporation, USA). Descriptive statistics, percentages and frequencies were used in order to analyse the data. Chi-square analysis was used to analyze the significant difference among farm rearing system and GI parasites, where a *P*-value <0.05 was regarded as significant.

## 3.0 RESULTS AND DISCUSSION

Table 1 depicts the overall prevalence of GI parasites isolated from goats in Terengganu. Three farms were selected which applied the intensive, extensive and semi- intensive rearing system. Out of 287 goats, 280 (97.6%) were found to be infected with GI parasites. Goats reared under the intensive rearing system reported the highest prevalence of infection (99%), followed by extensive rearing system with a slightly lower prevalence (98.3%). The lowest prevalence was reported in the goats reared under the semi- intensive rearing system with the percentage of 96%. There was no significant (*P*>0.05) different between the prevalence of GI parasites and rearing system.

A total of 287 goat fecal samples were examined in the laboratory. Five different parasite species were identified namely, *Strongyloides* spp., *Strongyle* spp., *Moniezia* spp., *Trichuris* spp., and *Eimeria* spp. as summarized in the Table 2. Table 2 shows the prevalence of different species of GI parasite isolated from goats in three farms in Terengganu. *Eimeria* spp., the only protozoa parasite infected goats reported the highest occurrence with the percentage of 89.2%. In addition, the dominant helminth parasite species found during the study period were the *Strongyloides* spp. with the infection rate was 45.6%, whereby the least encountered parasites were the *Trichuris* spp. which occurred at 8.4%. Both *Strongyle* spp. and *Moniezia*

spp. infected the goat with the percentage of 20.6% and 13.9%, respectively. There was significant (*P*<0.05) different between five types of GI parasite species in goat (Table 3).

The prevalence of GI parasites according to the farm rearing system is shown in Table 3. The prevalence of *Strongyloides* spp., *Strongyle* spp., *Moniezia* spp., and *Eimeria* spp. were significantly (*P*<0.05) associated with the rearing system. *Strongyle* spp., *Strongyloides* spp., and *Trichuris* spp. were reported highest in goats under the semi- intensive rearing system with the percentage of 33.1%, 83.1% and 10.5%, respectively. *Moniezia* spp. was showed highest in goats under the extensive rearing system which occurred at 26.7%, whereby *Eimeria* spp. was found dominant under intensive rearing system with the infection rate of 99%.

**Table 1** Overall prevalence of GI parasites isolated from goats in Terengganu (N= 287)

Rearing Systems	Total Number Examined	Number Infected	Percentage (%)
Intensive	103	102	99
Semi-intensive	124	119	96
Extensive	60	59	98.3
<b>Total</b>	<b>287</b>	<b>280</b>	<b>97.6</b>

**Table 2** Prevalence of different species of GI parasites in goats

Parasite	Total Number Examined	Number Infected	Percentage (%)
<i>Strongyloides</i> spp.	287	131	45.6
<i>Strongyle</i> spp.	287	59	20.6
<i>Moniezia</i> spp.	287	40	13.9
<i>Trichuris</i> spp.	287	24	8.4
<i>Eimeria</i> spp.	287	256	89.2

**Table 3** Prevalence of different species of GI parasites in goats in relation to three types of rearing systems

Parasite	Intensive (N=103)		Semi-Intensive (N= 124)		Extensive (N=60)	
	+ve	%	+ve	%	+ve	%
<i>Strongyle</i> spp.	0	0	41*	33.1	18	30
<i>Strongyloides</i> spp.	2	1.9	103*	83.1	26	43.3
<i>Trichuris</i> spp.	9	8.7	13	10.5	2	3.3
<i>Moniezia</i> spp.	11	10.7	13	10.5	16*	26.7
<i>Eimeria</i> spp.	102*	99	100	80.6	54	90

*P* value of less than 0.05 (\*) was considered statistically significant (\**P*<0.05). Note: +ve= positive

A cross sectional study was done from February to May 2015 on goats from three selected farms located in Terengganu. Data from the present study revealed that the overall infection rate of GI parasites in goat was 97.6% (280/287), which was closely related to the result reported by Arafa & Fouad [26] in Egypt who found 91.7% (321/350) of goats were heavily infected with GI parasites. However, as opposed to recent study, Edosomwan & Shoyemi [27] and Osakwe & Anyigor [28] have conducted study on parasitic infection in goats reared in Nigeria and the study

successfully recorded lower prevalence of infection with the percentage of 10% (14/135) and 65.5% (118/180), respectively. According to Kakar & Kakarsulemankhel [29], the variation in prevalence with different studies done may be due to differences in the geo-climatic surrounding, sample size, management system, and seasonal of the study areas.

In addition, results of the study showed that goats reared under intensive rearing system were more susceptible to parasitic infection which occurred at 99% (102/103). However, the study done in other developing countries such as Ethiopia [30], Bangladesh [10] and Nigeria [28] reported that goats under extensive rearing system had the highest prevalence of GI parasites with the prevalence of 75% (33/44), 86.14% (460/534) and 50% (49/98), respectively. As the result of the present study showed high infection rate in intensive management, the reason might be due to high stocking intensity of the goats in the farm. The goats under intensive system are occupied with 15-20 heads per shed, which can cause overcrowding. The goats under the semi-intensive and extensive systems are occupied with less than 10 heads per shed which can reduce the rate of parasitic infection. Overcrowding increased the chance of the goats to be in direct contact with each other. Thus, infection can be transmitted through closure skin contact with the infected animal as well as through ingestion of food and water contaminated with eggs or infective larvae [31].

Four species of helminthes were identified namely *Strongyloides* spp. (45.6%), *Strongyle* spp. (20.6%), *Moniezia* spp. (13.9%) and *Trichuris* spp. (8.4%), and also one type of protozoa parasite was discovered, mainly *Eimeria* spp. (89.2%). These parasites were reported in previous studies done by Murthy and Rao [32] in Telangana, Owheoli *et al.* [33] in Nigeria, Koinari *et al.* [5] in Papua New Guinea and Lone *et al.* [34] in Kashmir together with some parasites found in addition to those reported in current study. The findings showed that the predominant species found in goats was *Eimeria* spp. Similarly, *Eimeria* spp. was the major species identified in the study done by Majeed *et al.* [4], Solomon-Wisdom *et al.* [12], Minnat [35] and Gebeyehu *et al.* [36]. Coccidiosis had infected goats in a high number due to the fact that goats have low immune system [35], and this result was supported by Gorski *et al.* [37]. Among four species of helminthes discovered in goat, *Strongyloides* spp. emerged as the most prevalent parasite in goats. These findings were in agreement with those of Hassan *et al.* [38] and Almalai *et al.* [39] who studied GI parasites isolated from goats in Bangladesh and Western Sudan, respectively. Nevertheless, the present findings do not agree with the study done by Jittapalapong *et al.* [17] who claimed that *Strongyle* spp. (78.7%) was the most encountered parasite on goats in Thailand. *Strongyloides* spp. was predominant in goats may be due to the poor sanitation of the farms which promote parasitic infections in animals. During the visit to the farms, it can be seen that the farms were not regularly clean by the owners.

Besides, the findings of this study illustrated that three nematodes; *Strongyloides* spp., *Strongyle* spp. and *Trichuris* spp. were predominant in semi-intensive system. Semi-intensive rearing system is a system whereby goats were predisposed to helminthes infections due to grazing in a selective area [10]. The goats were grazing for 4-6 hours in a grazing land rich with grasses, thereby increase the opportunity for the grazing goats to unconsciously ingest the infective larvae that freely lived in the pasture [40]. This possibly happened especially when the temperature and humidity level are favorable enough to enhance the growth of parasites, thus increase the availability of the GI nematodes larvae in pastures. On the other hand, *Moniezia* spp. was reported higher in goats reared under extensive rearing system. The result obtained from this study was consistent with the previous study done by Rabbi *et al.* [10]. The rate of infection observed can be contributed by the fact that the goats were exposed to the contaminated water, pasture and soil [28] during grazing, as well as inadequate nutrition [41]. Eventually, *Eimeria* spp. was dominant in intensive zero-grazing goats. Similarly, a study conducted in Portugal [19] claimed that coccidiosis infected mostly intensive and semi-intensive reared goats.

## 4.0 CONCLUSION

In conclusion, the findings in the recent study revealed that most of the goats were infected with GI parasite infections. It may be concluded that the rearing system might not influence the occurrence of GI parasites in goats. However, further studies should be carried out to obtain a significant different between farm rearing systems by increasing the sample size. Besides, future studies can be focused on other factors infecting GI parasite infections in goats such as age, sex and seasonal factor.

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