UNIVERSITI PUTRA MALAYSIA

COMPARATIVE PREVALENCE OF HAEMOPARASITES IN KATJANG GOATS MANAGE INTENSIVELY AND SEMI-INTENSIVELY

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CERTIFICATION

It is hereby certified that we have read this project paper entitled ‘’ Comparative Prevalence of Haemoparasites In Katjang Goats Manage Intensively and Semi-Intensively, by Nursaidah Binti Mohd Kassim 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

In the name of Allah, the Beneficent, and the Merciful. This thesis is dedicated to my precious mother, Subahidah Sahib, sisters and brother. Thank you for all the support and encouragement all these years.

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ABSTRAK

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

PERBANDINGAN PREVALENS PARASIT DARAH DALAM KAMBING KATJANG YANG DITERNAK SECARA INTENSIF DAN SEPARA INTENSIF

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2015

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Kajian ini mengkaji kelaziman parasit darah pada Kambing Katjang yang diternak secara intensif (n=22) dan semi-intensif (n=22) di 4 buah ladang. Perbandingan prevalens parasit darah mengikut sistem, umur dan jantina dilakukan. Empat puluh lima sampel darah diambil dari vena jugular dan dikumpulkan ke dalam tiub venojet yang mengandungi EDTA. Smer darah nipis dibuat dan diwarnakan dengan perwarna Giemsa dan slaid tersebut diperiksa di bawah mikroskop cahaya. Prevalens parasit darah dalam kambing Katjang adalah 21.4%. Sistem pengurusan (intensif dan separa intensif) mempunyai perbezaan signifikan ($p<0.05$) dalam beban haemoparasit pada Kambing Katjang. Kambing Katjang yang diternak secara separa intensif mempunyai prevalens parasit darah yang lebih tinggi (19%) berbanding dengan kambing yang diternak secara intensif (2.4%). Oleh itu, Kambing Katjang yang diternak secara intensif tanpa membenarkan kambing meragut rumput di luar

boleh merendahkan bebanan parasit darah. Perbandingan antara umur dan beban parasit darah tidak memberi perbezaan signifikan ($p>0.05$), tetapi perbezaan antara jantina dan beban parasit darah memberi perbezaan signifikan ($p<0.05$).

Kata kunci: Parasit darah, kelaziman, intensif, separa intensif, sistem pengurusan.

ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfilment of the course VPD 4999 - Project.

COMPARATIVE PREVALENCE OF HAEMOPARASITES IN KATJANG GOATS MANAGE INTENSIVELY AND SEMI-INTENSIVELY

NURSAIDAH BINTI MOHD KASSIM

2015

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In this study the prevalence of blood parasites was determined in goats raised in 4 farms practicing either intensive (n=21) or semi-intensive (n=21) management systems. Comparison between different systems, age groups and sex was done. Blood samples were collected from the jugular vein of 45 Katjang goats and placed into EDTA tubes. To identify the blood parasites, a thin blood smear from each blood sample was prepared and stained with Giemsa stain, and then the slide was observed under a light microscope. The prevalent rate of haemoparasites in Katjang goats on these farms was 21.4%. The type of management system showed significant difference ($p<0.05$) on haemoparasite burden among the Katjang goats. Katjang goats managed semi-intensively had higher prevalent rate (19%) compared with goats managed intensively (2.4%). Thus, raising goats intensively without allowing them to graze can reduce the haemoparasite burden in Katjang goats. There is no significant difference ($p>0.05$) between the age groups (kids, young and adults) and haemoparasites load in Katjang goats. However, there is significant different ($p<0.05$) between the sexes and haemoparasites load.

Keywords: Haemoparasite, prevalence, intensive, semi-intensive, management system

1.0 INTRODUCTION

Katjang goat is a small local breed of goats that is primarily reared for meat. Poor management, poor nutrition, absence of herd health program, and diseases can adversely affect the productivity of these goats. One of the diseases is blood parasitism, which include anaplasmosis, babesiosis, eperythrozoonosis, theileriosis and trypanosomiasis.

In Malaysia, goats are usually managed either intensively or semi-intensively. Goats under semi intensive farming will be let out for grazing in the evening from 2 to 5pm, and thus these goats are more exposed to parasites. In intensive type of farming the goats are kept in sheds with minimum or zero exposure to parasites. Haemoparasites that have ticks as vectors include *Theileria* spp. and *Babesia* spp. are a problem in goat and sheep industries (Tahamtan et al., 2013). Anaplasmosis in sheep and goats is a worldwide problem, with highest prevalence in tropical and subtropical regions (Bowles *et al*., 2000; Kubelová *et al*., 2012).

The prevalence of tick-borne parasites is highest in extensive system (39.1%), followed by 13.8% in tethering system and 6.9% in intensive system (Angwech *et al*., 2011). Although in this study they did not compare the prevalence of blood parasites between intensive and semi-intensive system, we can appreciate that there is a difference in the prevalence of blood parasites between animals that are let out for grazing and reared intensively.

Tick-borne diseases can cause huge economic losses in developing countries like Malaysia (Uilenberg, 1995; Kubelová *et al*., 2012). This disease is associated with parasites, vectors or immediate host, vertebrate host and also the environment

(Norval *et al*., 1992;Angwech *et al*., 2011). However the association also depend on climatic changes, type of soil and vegetation, livestock production system and how the disease is controlled on a farm (Angwech *et al*., 2011).

It is believed that Katjang goat is quite resistant against diseases and ectoparasites specifically biting flies and ticks. In Malaysia, reports on the prevalence of haemoparasites in Katjang goat are dearth or are not current. Thus, the present study was conducted to determine the prevalence of blood parasites in Katjang goat and to compare the blood parasite load in Katjang goat that are reared intensively and semi-intensively and the prevalence of haemoparasites between age groups and sex.

2.0 LITERATURE REVIEW

2.1 Katjang goats

The only indigenous breed of goats in Malaysia is Katjang goat. Other names for Katjang goat is Kacang, Katchang, Licin and Pea Goat (Muneerah *et al*., 2011). Currently, Katjang goats are at risk of extinction and can only be found in small herds in Malaysia (Figure 1). They are mainly reared in Kuala Pilah, Negeri Sembilan (Muneerah *et al*., 2011).

Figure 1 : Distribution of pure Katjang goats in Peninsular Malaysia. (Map by Google map, 2011)

It has a thin black or dark brown hair coat sometimes with white patches on the belly and limbs (Devendra, 1966; Muneerah *et al*., 2011). The average birth weight is 1.5kg, and the adult weight is 25kg for males and 20 kg for females. The average daily gain is 55gm/day (Devendra & McLeroy 1982; Ernie Muneerah *et al*., 2011). Their growth rate is relatively slow when compared with other breeds (Devendra & Burns, 1983; Hirooka *et al*., 2008). Katjang has the ability to tolerate

heavy infestation of ticks and heat, and they are also able to withstand to harsh environment.

Goats are widely reared in Malaysia for meat and milk. According to FAO statistics goat population in the world is estimated at 87.5 million in 2011 with the highest population in Asia over 539 million. There is 16.52% increment of the world goat population from year 2000 to 2011 (Rodica *et al*., 2013). Food and Agriculture Organization of the United Nation (2005) also reported that in the last twenty years the world goat population has increased from 8% to 10% per year.

In Malaysia goat and sheep production average 2,386.5 metric tonnes while the demand was 22,549 metric tonnes. In 2013 self-sufficiency in goat production in Malaysia was 13.45% (Department of Veterinary Services). The DVS also reported that consumption of goats in Malaysia was estimated at 26,990.0 million tonnes in 2013.

Katjang goat is a meat type of goat and is considered a prolific breed as; it is able to breed all year round. However, due to its slow growth rate, low efficiency in reproduction and poor maternal ability, the use of this local stock as an efficient meat producer is limited. Therefore, Katjang goats are usually crossed between Jamnapari, Boer and other breeds. Crossbreed between Katjang goats with other exotic breeds of goats of high productivity trait will produce more productive offspring under local environment, with high tolerance to heat and tick infestation (Shrestha, 1998; Shrestha & Fahmy, 2005).

2.2 Intensive and semi intensive management system

There are three types of management systems in goat husbandry. They are intensive, semi-intensive and extensive systems. In Malaysia goats are usually reared in either intensive or semi-intensive management system.

In an intensive management system, animals are fed with grasses from cut and carry method. The animals are not allowed to graze (Kusiluka & Kambarage, 2005).They is placed in the sheds at all time. Animals that are reared in semi-intensive are released to the field for browsing. In a study by Imasuen, (2005) animal reared intensively utilized feed more efficiently.

In a semi-intensive type of management, the animals are also given cut and carry grasses but they are allowed to graze at certain times of the day (Kusiluka & Kambarage, 2005). This type of farming usually practises rotational grazing. For extensive system, the animals are allowed to browse at all times. There is no controlled breeding and supplementary feeding and also lack veterinary care in this type of management (Kusiluka & Kambarage, 2005). In extensive and semi-intensive managements, the goats are left to browse, and thus more energy is needed compared with animals that are managed intensively (Lachica & Aguilera, 2005; Herrera *et a*l., 2011).

2.3 Haemoparasites in goats

Haemoparasites are found worldwide. They are parasites that can be found in the animal's circulatory system. Parasites such as *Anaplasma spp*, *Babesia spp*, *Eperythrozoon spp*, and *Trypanosoma spp* are examples of parasites that can infect the blood of ruminants (Adejinmi *et al*., 2004). Aydin *et al* (2013), claimed that haemoparasites are present in animals that are reared in tropical and subtropical regions.

In goats, anasplasmosis can cause low grade fever and usually sub-clinical infestation (Blood and Henderson, 1985; Alessandra & Santo, 2012). However, in some circumstances, it can cause clinical severity (Barry & Van Niekerk, 1990; Alessandra & Santo, 2012). In some cases, anasplasmosis can cause acute pneumonia but it depends on the breed and concurrent infection in the goats (Alessandra & Santo, 2012).

Blood parasite infestation can also result in low packed cell volume, low haemoglobin concentration and reduced red blood cell level. In cases of theileriosis and babesiosis, macrocytic hypochromic anaemia can occur (Barnett, 1978; Zangana &. Naqid, 2011). *Mycoplasma ovis* (formerly known as *Eperythrozoon ovis*) also can result in haemolytic anaemia in sheep and goats (Neimark, 2004).

Theileriosis and babesiosis can cause clinical and subclinical infestation in ruminants (Friedhoff, 1997; Jongejan & Uilenberg, 2004; Aydin *et al*., 2013). Some *Theileria sp* are pathogenic in small ruminants, such as *T. lestoquardi*. It can lead to death in goats and sheep (Schnittger *et al*., 2000; Nagore *et al*., 2004). *Anaplasma ovis* in goats will localise in the membrane of red blood cells and anchored to the

intracytoplasmic vacuoles (Lestoquard, 1924; Alessandra & Santo, 2012). Goats with clinical or subclinical piroplasma can be sources for tick infestation as they carry the piroplasm (Durrani et al., 2011). In acute cases, haemoparasites can be diagnosed by microscopic examination of Giemsa-stained blood smear (Guo *et al*.2002; Yin *et al*.2003; Aydin *et al*., 2013).

Blood parasitism such as theileriosis and babesiosis can affect the country economy as it is significant in the international trade of livestock and their products (Yin *et al*., 1997; Preston, 2001; Uilenberg, 2001; Nagore *et al*., 2004).

3.0 MATERIALS AND METHODS

3.1 Animal

In this study two groups of goats were used for blood collection. The first group comprised goats from intensive system and the second group consisted of goats from semi-intensive system. In this study, the breed used is either pure Katjang or Katjang cross. All the farms are located in Selangor. Due to lack of Katjang goats at one farm, blood samples from this breed were collected from more than one farm for one system.

The first farm, Farm A1 practises intensive management system. This farm has a total of 20 goats of Boer, Katjang and Jamnapari breeds. From the total, 8 are males and 12 females and only 10 are Katjang goats. The goats are reared for meat and fed with Napier and common grass with no concentrates. The grasses are harvested in the morning and let to dry under the sun before they are fed to the goats. Vaccination was not practises in the farm.

Farm A2 also practises an intensive system of management. This farm has 80 goats of mixed breeds Boer, Katjang, and Jamnapari, but only 11 of them are Katjang. The goats are reared solely for meat. They are fed with goat pellets, soybean, and Napier grasses and also supplemented with molasses and salt blocks. This farm also does not practise vaccination, while the last deworming was 6 month ago (August 2014).

The following two farms are those that practise semi-intensive management system of farming. Farm B1 rears goats and sheep but they are kept separately in different sheds. The breeds of goats in the farm are of Boer, Katjang, and Jamnapari. The goats are fed with Napier grass and soy. The grasses were harvested and let to dry before they are chopped and fed to the animals. The goats are allowed to graze from 2.00 pm to 5.00 pm in the farm area. A total of 7 blood sample were collected from the Katjang goats.

Lastly is Farm B2 with 4 Boer and 14 Katjang goats. The goats are fed with Napier grass and goat pellets. The Napier grasses are harvested during the morning, evening or afternoon. The grasses are fed to the animal without drying. The goats are allowed to browse from 2.00 pm to 5.00 pm at around the farm area. There is no history of vaccination.

3.2 Estimation of body weight

By using a tape measure, the body weight of the goats was estimated. Firstly, the tape was placed around the goat's heart girth (Figure 2.1). Secondly, the distance from the point of shoulder to the pin bone was measured (Figure 2.2). By using the formula below, the body weight of each goat was measured in pounds. The weight was converted into kilograms by multiplying with 0.4536 as 1 pound equals to 0.4536kg (Infovets.com).

$$\frac{\text{Heart girth x heart girth x shoulder to pin distance}}{300} = \text{Body weight in pounds}$$

Figure 2.1: Heart to girt measurement

Figure 2.2: Shoulder to pin bone measurement

3.3 Blood collection

Using a sterile 23G needle, blood was collected from the jugular vein (Figure 2.3) into 3ml EDTA tube. The tube was kept in refrigerator at 4°C.

Figure 2.3: Jugular venipuncture

3.4 Microscopic examination of haemoparasites

A thin blood smear was made on a slide (Figure 2.4). Two smears were prepared from each sample. The slides were dried before they were fixed in methanol for 3 minutes. Next the slides were stained with 10% Giemsa solution for 30 minutes. The 10% Giemsa solution was prepared by mixing 10ml of 100% pure Giemsa in 90ml Phosphate Buffer Solution. Next, Giemsa solution was filtered with a filter paper into a clean container. Then, the slides were washed under running tap water and let to dry. Lastly, the slide was examined under a light microscope at 1000x magnification under oil immersion for any blood parasite (Figure 2.5).

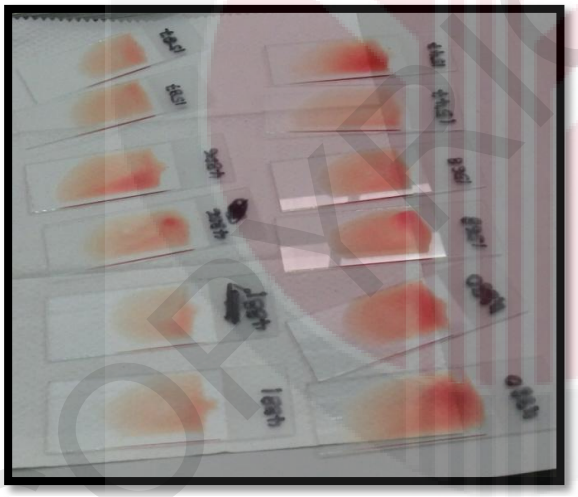


Figure 2.4: Thin blood smear was done and the slides were left to dry

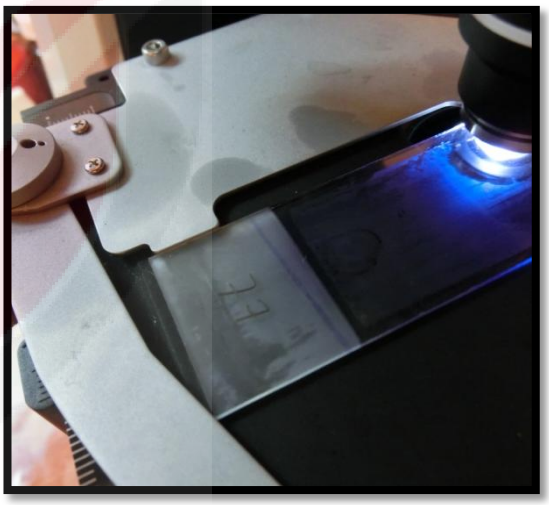


Figure 2.5: The slide was observed under microscope at 1000x magnification scale

3.5 Statically analysis

Data was tabulated and statistically analysed by IBM Statistical Package for the Social Science (SPSS) version 20.0. Chi-Square test was used to study the differences in management systems, age groups and sex of Katjang goats with the hemoparasites burden. Significance difference was determined at 95% significant interval ($P<0.05$).

RESULTS

Blood film under Giemsa stain

In this study we only managed to detect *Mycoplasma* sp and *Theileria* sp.

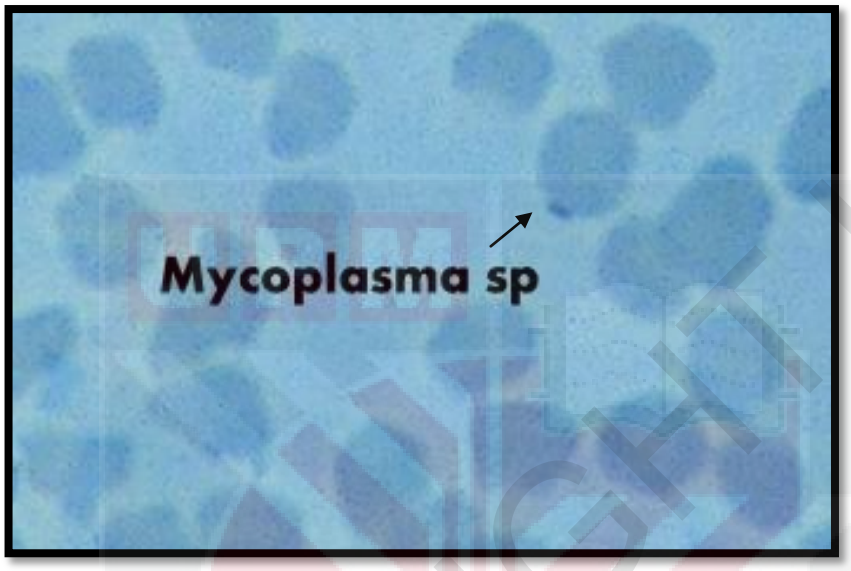


Figure 3.1 : *Mycoplasma* sp on red blood cell (arrow)

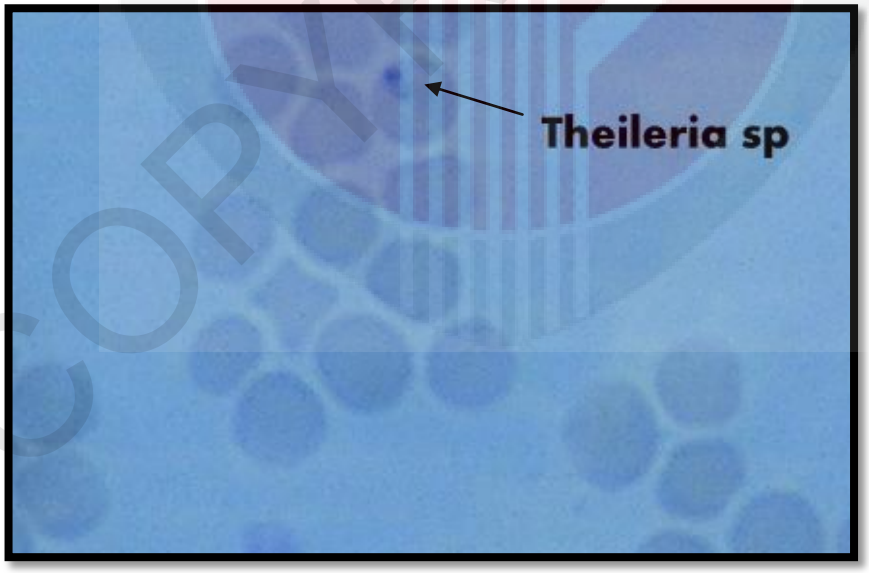
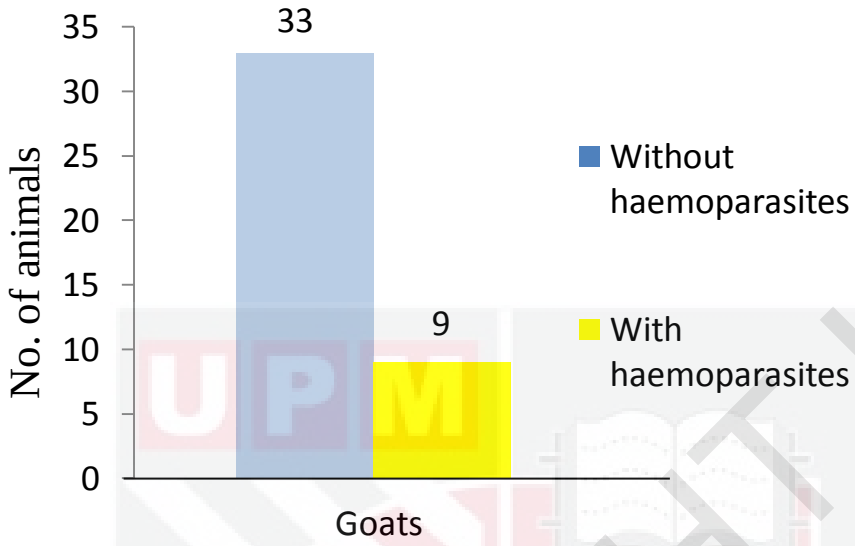


Figure 3.2 : *Theileria* sp on red blood cell (arrow)

Prevalence of haemoparasites at the 4 farms in Selangor

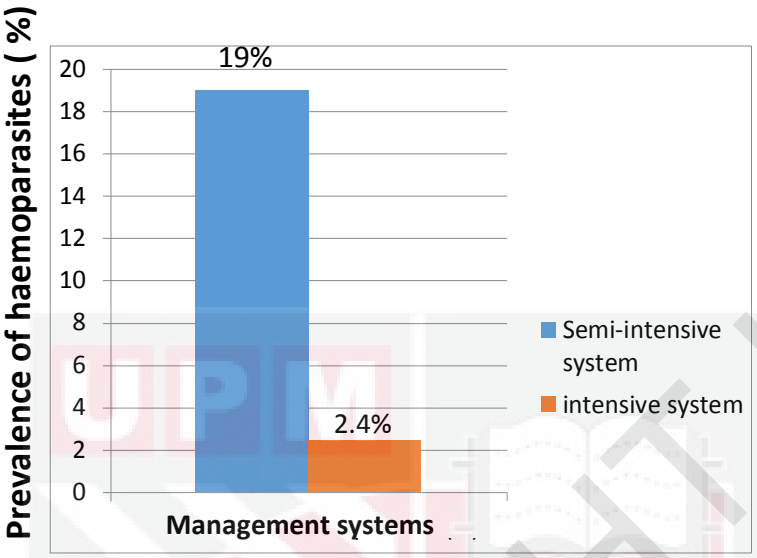


Katjang goats	Prevalence of haemoparasites
Total prevalence	21.4%

Table 1.1: Prevalence of haemoparasites in goats from the 4 farms in Selangor

Table 1.1 shows that the prevalence of haemoparasites in the 4 farms in Selangor is 21.4%.

Prevalence of haemoparasites between the management systems



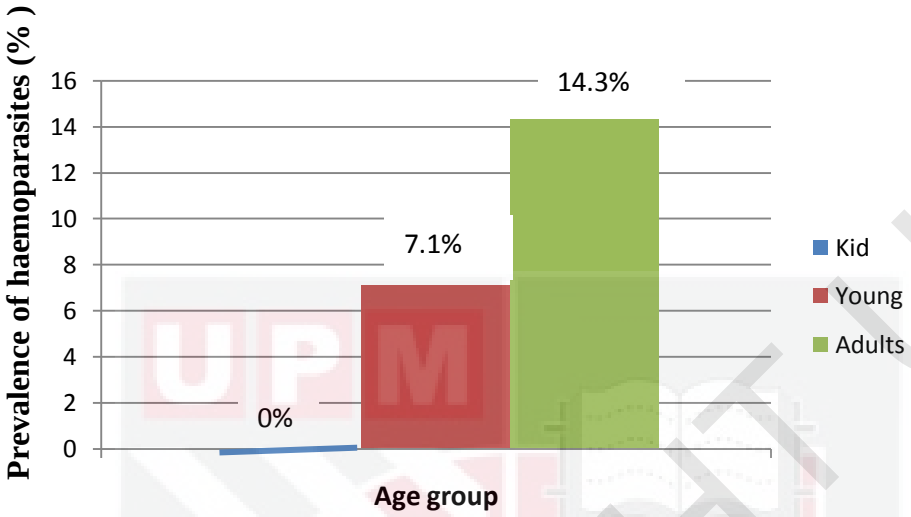
From this bar chart we can see that, the prevalence of haemoparasite in the semi-intensive system (19%) is higher than the intensive system (2.4%).

	Value	**df**	**Exact Sig. (2 sided)**
Pearson Chi-Squre	6.929	1	0.020

Table 1.2: Chi-Square test between the management systems and haemoparasite burden

Table 1.2 shows that the management system showed significant difference ($p<0.05$) on haemoparasite burden in the Katjang goats (Chi-Square = 6.929, df= 1, $p<0.05$).

Prevalence of haemoparasites between age groups



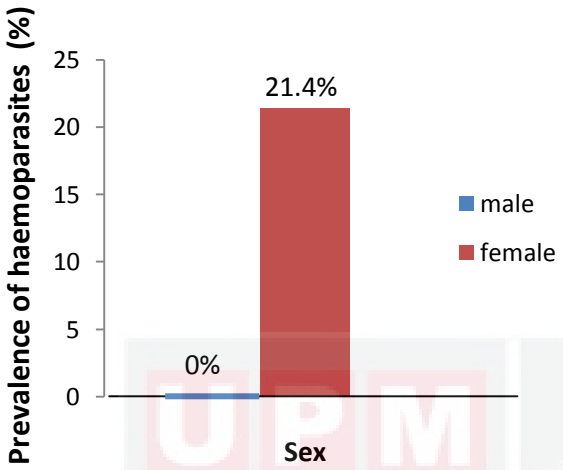
From this bar chart we can see that, the prevalence of haemoparasite is highest in adults (14.3%) follow by young (7.1%) and kids (0%) of the Katjang goats.

	Value	**df**	**Asymp. Sig. (2 sided)**
Pearson Chi-Square	4.455	2	0.108

Table 1.3: Chi-Square test between the different age group and haemoparasites susceptibility

This table shows that different age groups showed no significant difference ($p>0.05$) on haemoparasite burden in the Katjang goats (Chi-Square = 4.455, df= 2, $p>0.05$)

Prevalence of haemoparasites between sexes



From the above bar chart, female goats have higher prevalence of haemoparasite (21.4%), but none of the males have haemoparasite. This study shows that the female goats are more susceptible to haemoparasitism compared with male goats.

	Value	**df**	**Exact Sig. (2 sided)**
Pearson Chi-Square	4.582	1	0.041

Table 1.4: Chi-Square test between sex and haemoparasites susceptibility

This table shows that the sex of the goats is significantly difference ($p<0.05$) on haemoparasite burden among the Katjang goats (Chi-Square = 4.582, df= 1, $p<0.05$).

DISCUSSION

There is lack of data regarding the haemoparasite status in goats in Malaysia. The last study was done by Chandrawathani *et al*, in 2009 but only in the state of Perak and stated that the percentage of theileriosis was 27%. In the present study, the prevalence of haemoparasites in Katjang goats from 4 farms in Selangor is 21.4%. The highest percentage of haemoparasites that was detected is 0.3%. This means that in 1000 red blood cells, only 3 are infested with the parasites. This shows that the prevalence of haemoparasites in Katjang goats is low. This is probably because Katjang goats being indigenous to Malaysia, they have adapted well toward Malaysia environment and have developed resistance towards the haemoparasites. As reported by Muneerah *et al*. (2011), Katjang goats have the natural ability to tolerate heat and ticks under local climate. On this present study, no ticks were found on the body of the goats.

Most of the goats with haemoparasites showed no clinical signs of anaemia and jaundice. This means that the infestation is subclinical. Goats with clinical or subclinical infestation can be sources for tick infestation because they carry the piroplasm (Durrani et al., 2011). Thus, it is important to detect and eliminate the subclinical infected goats so as to decrease or eliminate haemoparasites on the farms.

One of the objectives of this study is to compare the haemoparasites load between intensive and semi-intensive system. This study reveals that goats in semi-intensive farm have higher prevalence of haemoparasites (21.4%) compared with intensive farm (2.4%). This shows that goats in the semi-intensive farm are more

susceptible to haemoparasites compared with goats in the intensive farm. A study done in Uganda, reveal that the prevalence of tick-borne parasites was highest in the extensive system (39.1%) and lowest in the intensive system (6.9%) (Angwech *et al*., 2011). Although in this study, no comparison was made on the haemoparasites burden between intensive and semi-intensive management systems, we can appreciate that the haemoparasites burden in free graze goats are higher compared with goats kept in shed. This shows that goats raised intensively without allowing free grazing may reduce the haemoparasites burden in the Katjang goats.

Haemoparasites may infect the goats due to many causes. Mycoplasmosis or eperythrozoonosis can be transmitted by poor management in farms, vaccination (use of same needle), ear tagging, and insects, such as mosquitoes, midgets and flies on wounds (Loh & Kabay, 2011). Other parasitic diseases such as theileriosis and babesiosis are tick-borne protozoa that require ticks as vectors to cause haemoparasitism (M'ghirbi, 2013).

Diseases caused by haemoparasites can be associated with their presence and distribution of their vectors (Sitotaw *et al*., 2014). Tick is an important vector in haemoparasite infestation because most of the haemoparasites are carried by ticks. The differences in the prevalence of haemoparasites between the management systems may be due to the contact frequency with this vector. Junquera (2014) stated that, the engorged adult female tick that is infected with the protozoa will drop from the host into the soil to lay eggs. The eggs will develop into larvae, and when animals browse at the infected area they may get the larvae. The larvae will develop into an adult on the animal's body.

Katjang goats in intensive systems have low contact with soil because they are inside the pens at all time, which result in the low prevalence of haemoparasites among them, when compared with goats in semi-intensive farms. This is because goats in semi-intensive farms are let for browsing, thus they have longer contact time with soil that may be infected with the larvae.

This study also reveals there is no significant different between the haemoparasites on age group of the Katjang goats (kids, young and adults). For the age group, the highest prevalence of haemoparasites is seen in adults, followed by young and kids. However there is no significant difference between age and haemoparasite. This study showed that, different in age groups may not affects the susceptibility to the haemoparasites in goats.

Other than management systems, this study also showed there is significant different on the haemoparasites between the sexes of the goats. Female goats have higher prevalence of haemoparasites (22.7%) compared with zero prevalence in male goats. However, this may be because of the uneven number of male and female goats used in this study. We only manage to get 12 male compared with 30 female goats; this may cause the high prevalence in female goats. More study need to be done with high number of goats to get more precise result.

CONCLUSION AND RECOMMENDATIONS

Haemoparasites usually cause subclinical infestation in goats and may result in low productivity. Haemoparasitism can lead to clinical signs when animal is stressed or immune suppressed. Different in management system affects the prevalence of haemoparasites in goats. Goats that are managed intensively can decrease the risk of haemoparasitism.

In Malaysia, there is a lack of study concerning haemoparasites in goats, and there is also no study being done concerning the relationship of management systems with the haemoparasites in goats. More studies need to be done, with large sample size to precisely detect the association of the haemoparasites with other variables such as management system, age, and sex in goats.

Recommendations following this study are, to expand this study to other states and increase the sample size to get the better number of prevalence of the haemoparasites in Malaysia. Other test such as polymerase chain reaction (PCR) are also recommend to be use to detect haemoparasites accurately up to species level.

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Appendix 1: Total number of Katjang goats used in this study.

System	Farm	Sex	Age (month)	Body weight (kg)	Mucous membrane	BCS	Haemoparasite
Intensive	A1	F	young	14	Pink	3	absence
Intensive	A1	F	young	20	Pink	2	absence
Intensive	A1	F	young	14	Pink	3	absence
Intensive	A1	F	young	21	Pink	3	absence
Intensive	A1	M	young	24	Pink	3	absence
Intensive	A1	M	young	31	Pink	3	absence
Intensive	A1	F	young	20	Pink	2	absence
Intensive	A1	F	young	22	Pink	3	presence
Intensive	A1	F	young	23	Pink	3	absence
Intensive	A1	F	young	29	Pink	3	absence
Intensive	A1	F	Adult	52	Pink	3	absence
Intensive	A2	F	Adult	53	Pink	3	absence
Intensive	A2	F	Adult	34	Pink	3	presence
Intensive	A2	M	Kid	20	Pink	3	absence
Intensive	A2	F	Adult	35	Pink	3	absence
Intensive	A2	F	Adult	51	Pink	2	absence
Intensive	A2	F	Adult	36	pale	2	absence
Intensive	A2	F	kid	7	Pink	2	absence
Intensive	A2	M	kid	8	Pink	2	absence
Intensive	A2	M	kid	9	Pink	2	absence

Intensive	A2	M	young	17	Pink	2	absence
Intensive	A2	F	Adult	29	Pink	2	absence
Semi-intensive	B1	F	young	33	Pink	3	absence
Semi-intensive	B1	F	young	31	Pink	3	absence
Semi-intensive	B1	M	kid	9	Pink	2	absence
Semi-intensive	B1	M	young	28	Pink	2	absence
Semi-intensive	B1	F	Adult	37.4	Pink	3	presence
Semi-intensive	B1	F	Adult	31.8	pale	3	presence
Semi-intensive	B1	M	young	13.2	Pink	2	absence
Semi-intensive	B2	M	young	15	Pink	3	absence
Semi-intensive	B2	F	Adult	36	Pink	3	presence
Semi-intensive	B2	F	Adult	34	pale	3	absence
Semi-intensive	B2	F	Adult	37	pale	3	absence
Semi-intensive	B2	M	young	14	pale	2	absence
Semi-intensive	B2	F	young	17	pale	2	presence
Semi-intensive	B2	F	young	21	pale	2	absence
Semi-intensive	B2	F	Adult	52	pale	3	absence
Semi-intensive	B2	F	young	15	Pink	2	presence
Semi-intensive	B2	F	young	27	pale	3	absence
Semi-intensive	B2	F	young	29	Pink	3	absence
Semi-intensive	B2	F	young	18	Pink	2	presence
Semi-intensive	B2	F	Adult	36	Pink	3	presence

Semi-intensive	B2	M	Adult	55	Pink	3	absence
Semi-intensive	B2	F	Adult	32	Pink	3	presence