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Original Article

Monieziasis in domestic ruminants in Perak, Malaysia

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Abstract

Monieziasis is a disease caused by *Moniezia* spp. The most common species of *Moniezia* found in ruminants are *M. expansa* and *M. benedeni*. The objective of the present study was to determine the status of monieziasis in domestic ruminants in Perak, Malaysia. A total of 11,933 fresh fecal samples from domestic ruminants in Perak were received for monieziasis screening, commencing from 2010 to 2017. Simple floatation was performed and 2.27% of the samples were detected to carry *Moniezia* spp.'s eggs. Among the positive cases, goat was dominant with 255 (94.10%) cases, followed by 10 (3.69%) cases for cattle, and 3 (1.10%) cases each for buffalo and sheep. The occurrence rate of monieziasis cases was between 5 and 77, with an average of 34 cases per year. The disease can be effectively controlled by reducing the exposure to pasture mites during grazing, and by application of good management practices.

Keywords: *Moniezia* spp., monieziasis, tapeworm, ruminant, Malaysia

1. Introduction

Monieziasis is a gastrointestinal disease caused by the wide segmented intestinal tapeworm, *Moniezia* spp. The Anoplocephalid cestode belongs to the order of Cyclophyllidea, which is characterized by the absence of hooks and rostellum. Morphologically, its body consists of small anterior scolex and neck, followed by the long chain strobila with species-specific patterning. Based on the morphological structure, at least 12 species of *Moniezia* have been identified in domestic and wild ruminants (Diop *et al.*, 2015; Ohtori, Aoki & Itagaki, 2015). Among them, *M. expansa* and *M. benedeni* are the most common ruminant tapeworms with worldwide distribution (Guo, 2017; Yan *et al.*, 2013). According to Mehlhorn (2008), the length of *M. expansa* may reach up to 10 meters.

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Moniezia spp. requires pasture mites, which live freely in grass or soil, as an intermediate host to complete it life cycle (Khadijah *et al.*, 2014). According to Shimano (2004), the genera of the mites important to the life cycle of *Moniezia* spp. are *Oribatura* and *Scheloribates*. The triangular and tetragonal eggs of *M. expansa* and *M. benedeni*, respectively, which are ingested by the mites, will develop into an infective larval stage known as cysticercoids in 6 to 16 weeks (Fox, 2018). Ingestion of the infective larvae by ruminants as the definitive hosts will result in the onset of monieziasis. The larvae will develop into adult tapeworms in the host's small intestine (the predilection site) to complete their life-cycle and oviposit. The eggs are then passed out with the feces.

Economically, infections by *Moniezia* spp. have become a major concern in the livestock industries (Thooya van, Kathikeyan & Govindarajalu, 2018). Even though the damages caused by the tapeworms are lesser compared to roundworms, significant economic losses were seen globally in husbandry of buffaloes and sheep (Cedillo *et al.*, 2015;

Prchal *et al.*, 2015). There is no report on significant economic losses due to the infection caused by *Moniezia* spp. alone in Malaysia. Nonetheless, as the population of domestic ruminants, specifically in Perak, is increasing annually with 48,757 cattle, 10,302 buffaloes, 31,569 goats and 3,981 sheep in 2017 (Department of Veterinary Services, 2018), the infection trends must be studied in order to identify possible economic effects. Therefore, the aim of this study was to determine the status of monieziasis in domestic ruminants in Perak, Malaysia, by retrospective assessment of the cases submitted to Veterinary Research Institute, Ipoh, Perak.

2. Materials and Methods

A total of 11,933 fresh fecal samples (2,189 cattle, 223 buffaloes, 7,809 goats and 1,712 sheep) from 10 districts in Perak were received from 2010 to 2017 for gastrointestinal parasite screenings. All the samples were collected by direct rectal fecal collection method and stored in sealed plastic bags at chilled temperature prior to transportation to the Parasitology Laboratory of Veterinary Research Institute (VRI), Ipoh, Perak.

Fecal examination of samples was done by using the simple floatation technique as described in Manual of Veterinary Laboratory Testing for Parasitology (Department of Veterinary Services, 2016). This involved weighing a two-gram fecal sample and adding saturated sodium chloride solution. The samples were then filtered through a stainless steel mesh screen into a 15 mL collection tube. The collection tubes were then slowly filled with saturated sodium chloride solution, until the meniscus of the solution can be seen at the mouth of the tube. Cover slip was then gently applied on the meniscus and left for 15 minutes. The slip was then put onto the microscope slide before observation under the compound microscope (Leica DME, USA) at x 100 power of magnification to detect the presence of *Moniezia* spp.'s eggs.

3. Results

The result showed that 271 (2.27%) of the domestic ruminant's samples were diagnosed positive for *Moniezia* spp.'s eggs (Figure 1) from 2010 to 2017. The total cases of monieziasis in goats numbered 255 (94.10%), followed by 10 cases (3.69%) in cattle, and 3 cases (1.10%) each for buffaloes and sheep. Based on the type of ruminants, the highest percentage of positive cases was seen in 2012 for goats and cattle, with 7.14% (74 out of 1,037) and 1.55% (2 out of 129), respectively. As for buffaloes and sheep, the most positive cases were reported at 4.76% (2 out of 42) and 1.12% (1 out of 89), respectively, in 2013. The numbers of monieziasis cases and the infestation trends by year and type of ruminant are further presented in Table 1 and Figure 2, respectively.

Samples were received from 10 out of the 12 districts in Perak. There were no samples received from Kerian and Bagan Datuk districts. Based on the results, the most positive cases were from the Kuala Kangsar district with 105 cases, and the least from Hulu Perak district with only a single case (Figure 3).

Monieziasis was diagnosed every year in goats with at least four cases a year from 2010 to 2017. Conversely, in cattle, the samples were only negative during 2014 and 2017. For buffaloes, the positive cases were diagnosed in 2012 (1 case) and 2013 (2 cases). In sheep, one positive case was detected per year in 2013, 2014 and 2017. The range for monieziasis cases was from 5 to 77, from 2010 to 2017, with

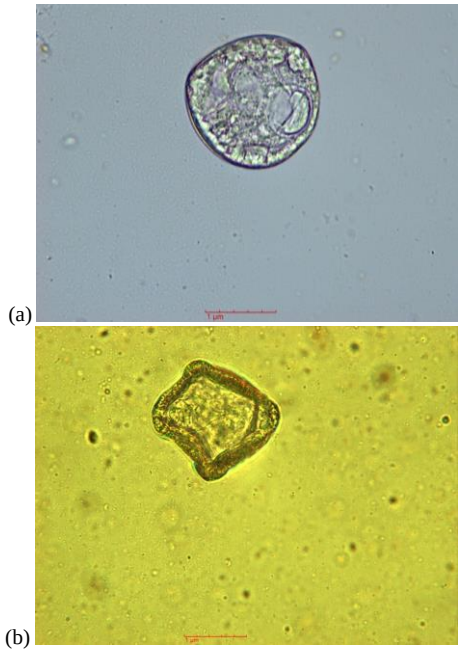

Figure 1. The morphology of *Moniezia expansa* egg from goat fecal sample (a), and *Moniezia benedeni* egg from cattle fecal sample (b) (X400 magnification)

Table 1. The number of monieziasis cases by year and type of ruminant

Year	Number of monieziasis cases			
	Cattle	Buffalo	Goat	Sheep
2010	3/428	0/37	18/1989	0/97
2011	2/531	0/79	34/1014	0/63
2012	2/129	1/33	74/1037	0/13
2013	1/229	2/42	36/1020	1/89
2014	0/292	0/22	62/1837	1/98
2015	1/200	0/2	22/510	0/330
2016	1/239	0/6	5/222	0/370
2017	0/141	0/2	4/180	1/652

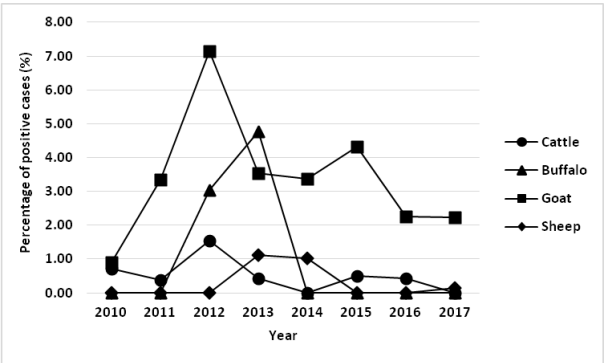

Figure 2. The trend of monieziasis cases by year and type of ruminants

average and median of recorded counts at 34 and 30 cases per year, respectively. The total number of positive cases for these eight years of screening is presented in Figure 4.

4. Discussion

The number of monieziasis cases detected from the total submitted samples in Perak was quite low, only 2.27%. In comparison with other countries, the prevalences for *Moniezia* spp. infestation in goats and sheep in Grenada and in the West Indies were reportedly at 14.00% and 4.00%, respectively (Chikweto *et al.*, 2018). Another study by Sultan, Elmonir & Hegazy (2016) showed that the prevalence of helminthiasis in sheep in Kafrelsheikh governorate, Egypt, was 37.05%, with 26.79% nematodes, 9.38% trematodes and 0.89% cestodes, whereas all the cestode eggs detected were *Moniezia* spp. Sani, Adnan, Cheah & Chandrawathani (2004) reported that 51.00% of the 72 necropsied goats were found with *M. expansa*, together with *Haemoncus contortus* (67.00%), *Oesophagostomum columbianum* (42.00%) and *Trichostrongylus colubriformis* (38.00%) in the state of Selangor, Malaysia.

Among the screened domestic ruminants, the most positive cases were reported in goat with 3.27% (255 out of 7,809) testing positive. According to Kantzoura, Kouam, Theodoropoulou, Feidas & Theodoropoulos (2012), besides climate, also the age and educational level of farmers, and type of farm management are risk factors for gastrointestinal parasite infestation. Based on the record, most of the positive cases were from the intensive and semi-intensive type of goat farming. Irie *et al.* (2013) reported that *Moniezia* spp. is more prevalent in extensive or grazing type farm management than in other types. As the intermediate host of the *Moniezia* spp. is pasture mites, exposure of the ruminants to soil and grass will increase the chances of infestation. In the state of Terengganu, Malaysia, Hashim & Yusof (2016) reported that 13.90% of *Moniezia* spp. were detected from a total of 287 goat fecal samples, where 10.70%, 10.50% and 26.70% were from intensive, semi-intensive and extensive farming management, respectively.

Definitive diagnosis of monieziasis in live ruminants is difficult, and the worm is usually only found during necropsy. In this study, all the positive cases were diagnosed from the presence of *Moniezia* spp. eggs by qualitative simple floatation method. The quantitative egg count method was not used due to it being a poor predictor of tapeworm burdens as the number of proglottid-containing eggs from a single tapeworm in the feces may vary (Dever, Kahn & Doyle, 2015). The clinical signs of monieziasis are dependent on the worm burden and severity of infestation. In calves, Fox (2018) has reported the occurrence of intestinal stasis due to monieziasis. Patil, Sawale, Ramteke, Pallampale & Bharkad (2016) stated that heavy infestation by *M. expansa* usually resulted in adverse clinical symptoms such as rough coat hair, pot-belly and anaemia. Nishizaki (2000) also reported the occurrence of loss of growth efficacy in calves due to the infestation by *M. benedeni*. In this study, the infested ruminants showed no specific clinical signs.

Similarly as to controlling other types of helminths, good farm management including cleanliness of the pens, water and feeding trays, will reduce the possibility of this

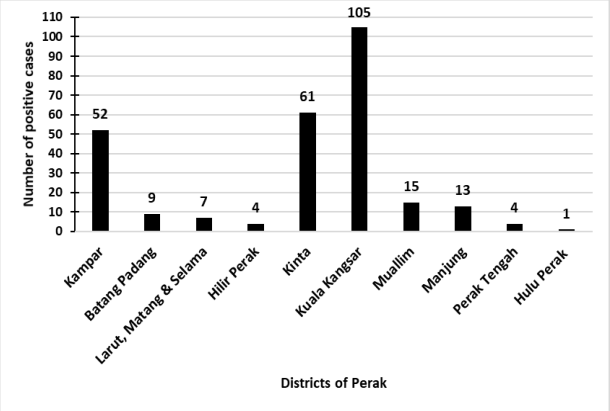

Figure 3. The total number of positive monieziasis cases by district of Perak over 8 years (2010 to 2017)

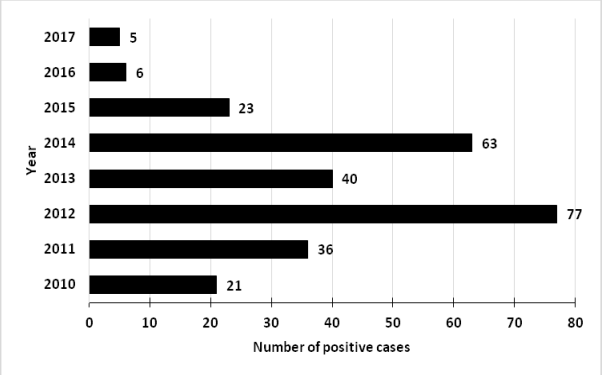

Figure 4. Total number of positive monieziasis cases in Perak by year (2010 to 2017)

infestation (Zainalabidin *et al.*, 2015). Specifically for *Moniezia* spp., the accidental ingestion of the oribatid mites containing tapeworm larvae can be prevented by avoiding grazing on humid pasture, especially during the active period of the mites, which is in the early morning and at night. Treatment for infested ruminants can be done by deworming with anthelmintic to reduce the spread of the disease. In cattle, Irie *et al.* (2013) have reported on successful elimination of *M. benedeni* with praziquantel (PZQ) at 5 mg/kg BW orally. For goat, the combinations of PZQ and oxyclozanide at 5 and 10 mg/kg orally have shown improvement in symptoms after the third day of treatment (Uke, Rafiqi, Kumar & Durge, 2017).

5. Conclusions

This study revealed that monieziasis in domestic ruminants in Perak was under control with 2.27% of positive cases over 8 consecutive years (2010-2017). Among all the species, the case count was led by goats, in which *Moniezia* spp.'s eggs were detected every year from the samples received. Continuing control of the spreading of the disease by intensive or semi-intensive farm management, maintaining the cleanliness of the farm and facilities, and reducing exposure to the pasture mites will help minimize the occurrence of this disease.

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