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Short Communication

Presence of Parasite Larvae in Goat Manure for Use as Fertiliser

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ABSTRACT

Some livestock farmers utilise goat manure to fertilise grasses grown for animal feed, which may lead to parasitic diseases caused by strongyle infection. Therefore, the presence of strongyle larvae in manure needs to be determined. In this study, goat faeces containing strongyle eggs were deposited into five replicates for daily sampling throughout 23 days and subjected to faecal egg count, larvae identification and enumeration. Absence of eggs was detected on Day 4 when the infective larvae of *Haemonchus contortus, Trichostrongylus* sp. and *Oesophagostomum* sp. were found. Larvae counts reached a maximum of 164 larvae on Day 8 and were negligible by Day 14, by which time the manure can be used as fertiliser to grow forage crops for animal feed.

Keywords: Strongyle larvae, goats, manure, fertiliser

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INTRODUCTION

One of the major infections affecting small ruminants throughout the tropics and sub-tropics is gastrointestinal strongylosis (Sani *et al.*, 2004a; Jackson & Miller, 2006; Krecek & Waller, 2006). The infected animal passes out strongyle eggs with its faeces and upon hatching, develop into free-

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living stages, namely, first (L1), second (L2) and third (L3) stage larvae. The infective larvae L3 migrate to grass and are the source of infection to the grazing animal (Barger, 1999).

The survival of L3 in tropical or sub-tropical countries is much shorter than in temperate regions because of the limited feed reserves in the non-feeding larval stage (Waller, 2006). An investigation on the survival of L3 on open pasture and vegetation under tree crops in Malaysia revealed that L3 emerged within one week with a minimum time of 3.5 days after faecal deposition and survived up to eight weeks (Sani *et al.,* 2004b). Livestock farmers usually apply the available manure on their farms to fertilise grasses grown for animal feed. Knowing the survival period of strongyle L3 in animal manure is essential to reduce L3 ingestion by the animals.

Therefore, the objective of the present study was to determine the presence of strongyle larvae in goat manure to assess its safety for use as fertiliser.

MATERIALS AND METHODS

Site and Animals

A study was carried out at the Goat Unit, Livestock Section, University Agricultural Park, Universiti Putra Malaysia (UPM). Information on weather parameters during the study was obtained from the Department of Land Management, Faculty of Agriculture, UPM. The location was recorded as having a total rainfall of 273.5 mm in November 2011 when this study was conducted.

A goat house with raised wooden slatted floor and concrete ground floor was located at this unit. The grass growing in the fenced area around the goat house was maintained at a height of approximately 5 cm throughout the year. Twenty-two goats of both sexes comprising the breeds of Katjang, Saanen and Boer crosses which ranged from less than 1 year-old to more than 5 year-old were raised in this house. The goats were last dewormed with ivermectin six months prior to the study.

Faecal Egg Count

Out of the 22 goats, 18 were detected to be infected with gastrointestinal strongyles by the modified McMaster technique (Lyndall-Murphy, 1993) 24 hours before the start of the study. The faecal egg counts (FEC) of the 18 goats ranged from 100 to 8900 eggs per gram (epg) of faeces with a mean FEC of 2078 epg.

Deposition and Sampling of Faeces on Plots

Five plots separated by a distance of at least 1.5 m representing five replicates were identified in the area to deposit the faeces. The faeces deposited by animals over a 24-hour period were collected from the concrete ground floor and mixed thoroughly prior to deposition on plots. The bulked faeces were divided into five replicates weighing approximately 1 kg each and heaped on each plot to imitate a natural deposit in mound-form as usually practised by the farmers. Faecal samples were collected daily in the

morning from each mound of faeces until eggs and strongyle larvae were no longer detected. One gram of faeces was need for FEC, whereas approximately 5 grams of faeces was collected for larvae recovery from each mound of replicate.

Parasitological Techniques

Each faecal sample was subjected to FEC by the modified McMaster technique until zero epg was detected to confirm the absence of eggs in all replicates. The samples were also subjected for larvae recovery by the modified Baermann method (van Bezooijen, 2006) that was carried out from Day 4 of zero epg until no free-living larva was recovered. The larvae were collected for identification and enumeration of pre-infective and infective stages. Identification of L3 was done to the genus level.

RESULTS AND DISCUSSION

FEC of 2000 epg indicated a worm burden of 1800 adult *Haemonchus contortus* and 1500 adult *Trichostrongylus* sp. (Israf *et al*., 1996). The results of the present study indicated that the goat farm with a mean FEC of 2078 epg revealed a parasitic problem. Mean FEC of manure replicates declined from 660 epg on Day 1 to 0 epg on Day 4. The absence of strongyle eggs starting from Day 4 indicated that by then all eggs had hatched. This led to the detection of both pre-infective and infective larvae on Day 4 until Day 22 (Fig.1). The pre-infective strongyle larvae consisted of L1 and L2, which were observed on Days 4 and 5. Their absence thereafter indicated that the pre-infective larvae had moulted into infective larvae by Day 6. The findings were consistent with those of Sam-Mohan (1995), who observed that L3 emerged from the faeces on Day 4 and migrated to herbage on Day 6.

Fig.1 shows that the number of *Haemonchus contortus* larvae peaked on Day 6 with 127 larvae and decreased steadily thereafter until no larva was detected on Day 21. *Trichostrongylus* sp. infective larvae existed longer until Day 22 when only one L3 was found. It peaked with 85 larvae on Day 8. *Oesophagostomum* sp. larvae were recovered in low numbers throughout the study with the highest count of 10 on Days 8 and 9 and absent by Day 16. Overall, the highest L3 count on the manure was observed on Day 8 with 164 larvae, which consisted of *Haemonchus contortus, Trichostrongylus* sp. and *Oesophagostomum* sp. In a study by Dobson *et al.* (1990a), geometric mean of total worm burden observed in lambs infected with 200 *Trichostrongylus colubriformis* L3 per day, 5 days per week for 7 weeks was 3167. However, the estimated threshold worm burden of 3532 must be exceeded before any substantial resistance to infection begins to develop (Dobson *et al.,* 1990b). Therefore, small numbers of L3 ingested continuously contributed to a build up of total adult worm burden which led to devastating effects on the goats.

Following the pattern of larvae presence in the faeces, the goats might be predisposed to parasitism if the manure containing L3 was used as fertiliser on

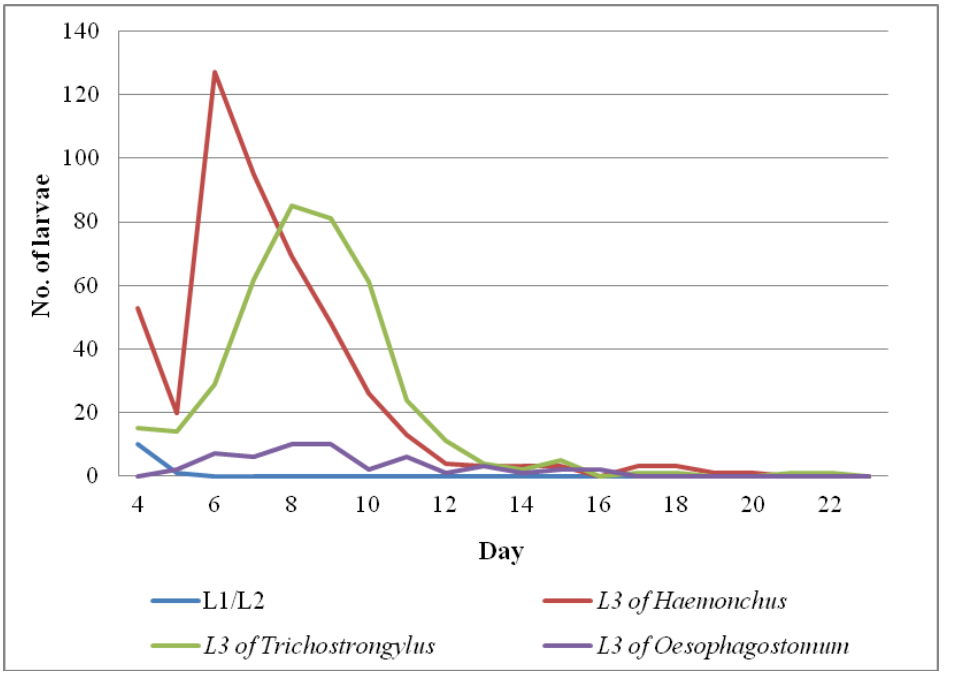

Fig.1: Presence of strongyle L1, L2 and L3 in goat manure.

grasses between Days 4 to 14 of faecal deposition. However, all the larvae were undetected on Day 23 due to their ability to migrate to a more favourable micro-environment, which also attributed to their longevity (O'Connor, 2006). Consequently, goat manure purposely accumulated in the farm to be used as fertiliser should be kept for at least 14 days before being applied on grasses meant for animal feed as the larvae count was found to be negligible by that time. Throughout the study, *Haemonchus contortus* (51%) was the most predominant species followed by *Trichostrongylus* sp. (43%) and *Oesophagostomum* sp. (6%).

CONCLUSION

The most hazardous time to use goat manure as fertiliser was on the eighth day after manure deposition as it contained the highest number of infective larvae. The recovery of infective larvae of gastrointestinal strongyles in goat manure until Day 22 indicated that an original manure mound made without continuous addition of fresh faeces was free of the larvae from Day 23. However, the negligible number of L3 in the mound by Day 14 suggests that the manure when applied as fertiliser to grasses and other forage crops did not harbour many infective larvae.

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