

PRELIMINARY STUDY OF NEMATODE RESISTANCE TO ANTHELMINTIC DRUGS IN TWO GOAT FARMS IN TERENGGANU

Faisal Abubakar^a, Asmad Kari^{a*}, Zawawi Ismail^b, Tijjani Haruna Usman^a, Abdul Rashid Baba^c

^aSchool of Animal Science, Faculty of Bioresource and Food Industry, Universiti Sultan Zainal Abidin (UniSZA) Malaysia

^bDepartment of Veterinary Services, Pusat Teknologi Haiwan Tersat, 21700 Kuala Berang Terengganu, Malaysia

^cFaculty of Sustainable Agriculture, Universiti Malaysia Sabah, 90509 Sandakan Sabah, Malaysia

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*Corresponding author

asmad@unisza.edu.my

Abstract

Gastrointestinal nematodes considered to be among the factors that could affect the goats' productivity. The objective of this study was to evaluate the current status of nematode resistance to anthelmintic drugs in two farms (Veterinary Research Academy Jenang, Marang and Hulu Seladang Setiu Farms). The goats were randomly divided into five treatments which include control (A), albendazole oral administration (B), levamisole oral administration (C), ivermectin subcutaneous injection (D) and ivermectin pour on groups (E). After two weeks of the treatment the feces were collected and fecal egg count was examined. The mean of fecal egg count reduction (FECR) obtained was not statistically ($p > 0.05$) different between the treatments, and FECR% was lower than 66% in all of the five treatments (A, B, C, D and E). In conclusion, two farms revealed the resistance of nematode to Albendazole, Levamisole, and Ivermectin anthelmintic drugs. This study suggested that the anthelmintic treatment is unlikely to be the suitable method of controlling nematode population, thus studies are needed to investigate further on the effectiveness of other methods of control such as the use of herbs.

Keywords: Gastrointestinal nematodes, Anthelmintic, FECR

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1.0 INTRODUCTION

The pivotal aspect of a successful goat breeding is attributed to their management and productivity. Gastrointestinal nematodes are considered among the factors that could affect the goats' productivity. There are a number of gastrointestinal nematodes parasites attacking goats. The nematode parasites are known to be the most hazardous helminths to livestock causing high diarrhea and decreased in appetite that greatly affect the normal growth and production of the goats [1,2]. These in turn lead to economic loss in the livestock industry [3]. As a result, several anthelmintic drugs of both broad and narrow spectrum were used for the cure. The commonly use of anthelmintic in the market for livestock animals are Fenbendazole, Albendazole, Levamisole and Ivermectin [4]. Despite the fact of several anthelmintic treatments, researches revealed the presence of

anthelmintic resistance in the Malaysia [5,6]. There are a number of nematode species in Malaysia but *Haemonchus contortus* is the major gastrointestinal nematode species reported in small ruminant farms in Peninsular Malaysia [5]. In various goat farms nematode is controlled using chemical drugs like anthelmintic, but their effectiveness is restricted by the development of the anthelmintic resistance [3].

In Malaysia, the occurrence of anthelmintic resistance towards multiple drugs from different groups was reported by various authors [5,6]. Consequently, the high susceptibility of anthelmintic resistance leads the requirement of alternative strategies to control the parasite infection in goat [7]. A suitable type of drug, dose and route of administration is important for safety and efficacy of the treatments [8]. Although the different route of anthelmintic administration has varying profile and influence in terms of pharmacokinetics and effectiveness [9]. Similarly, the

effects of anthelmintic depend on the ability of the active drug to reach the specific receptor within the target and drug concentration in the tissue where the parasite is located [10].

A reliable and common method used for determining the efficacy of anthelmintic was by the fecal egg count reduction test (FECRT) [11]. Myriad research revealed the status of anthelmintic resistance to small ruminant in Peninsular Malaysia including Perak [12,13,14] and Kelantan [15] that shows anthelmintic resistance was on the rise. Unfortunately no available information on Nematode resistance to anthelmintic drugs in Terengganu, despite the farms are exposed to the parasite due to the climatic condition of the environment and pasture that favour their prevalence. Therefore, the objective of the present study was to evaluate the current status of nematode anthelmintic resistance in two selected goat farms in the state of Terengganu to three locally available anthelmintic, albendazole, ivermectin and levamisole.

2.0 EXPERIMENTAL

2.1 Study Area

The study was conducted in Veterinary Research Academy Jenang, Marang and Hulu Seladang Setiu, Terengganu. The experimental animals' procedures were approved by the Universiti Sultan Zainal Abidin Animal Ethics Committee (UniSZA/AEC/14/009), Terengganu, Malaysia.

2.2 Experimental Animals

The study was carried out using animals with high worm bio burden, 30 Jamnapari goats age 2-3 years and weighted 26-42 kg from Veterinary Research Academy Jenang, Marang and 60 goats from Hulu Seladang Farm Setiu, Terengganu. All goats were individually identified by their tag. The animals measured with more than 150 eggs per gram (epg) of feces before treatment were selected for the study considering it the most effective test for estimating anthelmintic resistance in ruminants [11]. The infected goats from the two farms were randomly divided into five treatments which include control group (A), albendazole oral administration (B), levamisole oral administration (C), ivermectin subcutaneous injection (D) and ivermectin pour on (E). After two weeks of the treatment feces were collected and fecal egg count was examined using Mc Master Method [16].

2.3 Fecal Collection and Egg Count

Six grams fecal sample were collected directly from the rectum of individual animal and put in ice box. Four grams of feces were weighed and put into a beaker. The feces were mixed with 56 ml of saturated salt solution, and the mixture was stirred thoroughly with a spatula and filtered with fecal suspended

through a gauge into the second container. A pasture pipette was used to withdraw the sub-sample from the beaker, the fluid was stirred and filled (0.15 ml) the first compartment of McMaster's counting chambers [16], similarly the second chamber in order to determine the Strongyle species egg. The McMaster's counting chambers was allowed for five minutes (to enable floatation of the eggs at the surface and the debris down to the bottom) before been examined with a microscope at 100x magnification. The number of eggs within the grid of each chamber was counted, ignoring those outside the squares. The mean eggs calculated from the two chambers were recorded.

2.4 Data Analysis

The fecal egg count reduction percentage FECR% of the treatments were analysed using one-way ANOVA at 5% level of significance with the help of Statistical Package for Social Sciences (SPSS) version 20. Fecal eggs were used in this study to determine the number of nematodes present during before and after treatments of anthelmintic. The volume of each counting chamber was 0.15 ml and 0.15 ml of 4 g feces solution in a volume of 56 ml with eggs. The eggs per gram (e.p.g) was obtained from eggs seen in chamber one (a) and eggs seen in chamber two (b) which were calculated as $(a+b) \times 50 = \text{e.p.g}$. The FECR was calculated using the formula $\text{FECR}\% = (\text{mean e.p.g before} - \text{mean e.p.g after}) / \text{mean e.p.g before} \times 100$

3.0 RESULTS AND DISCUSSION

The presence of anthelmintic resistance in Veterinary Research Academy Jenang Farm, Marang and Hulu Seladang Farm Setiu is shown in Table 1 and 2, respectively. The FECR% was used as a means of determining the level of anthelmintic drug resistance in this study. According to the classification of Khadija *et al.* [19] anthelmintic resistance is said to be considered as critical when FECR% is less than 50%, severe at 50-90% and moderate at 91-95%.

From the result critical resistance to albendazole, levamisole and ivermectin exists in Veterinary Research Academy Jenang Farm, likewise in Hulu Seladang Farm critical resistance to ivermectin exist and severe resistance to albendazole and levamisole was recorded. However, there was no statistical different ($p > 0.05$) in both of the treatments regarding their FECR%. Moreover, in this study the FECR% obtained in all of the treatments was below 66%. These were lower than that reported by Suarez *et al.* [17] which mentioned 52% in levamisole, 72% albendazole and 80% ivermectin treatments in lambs. Similarly, 81% of ivermectin resistance and 98% was of levamisole was reported in goats [18]. The differences observed between the studies may be due to the species variation and environmental factors like the animal management and feeding system.

Table 1 Fecal egg count reduction (FECR) of nematodes at Veterinary Research Academy Jenang, Marang

N	Treatments	Epg before (mean±SD)	Epg after (mean±SD)	FECR%
3	A	283±14.4	833±43.1	-194
4	B	325±41.7	350±32.4	-8
3	C	583±70.7	366±10.4	37
3	D	233±23.6	366±12.5	-57
3	E	283±31.7	466±27.5	-65

Table 2 Percentage of fecal egg count reduction (FECR) of nematodes at Hulu Seladang Farm setiu, Terengganu

N	Treatments	Epg before (mean±SD)	Epg after (mean±SD)	FECR%
4	A	1950±49.1	2725±154.7	-40
4	B	1925±205.3	887±54.8	54
4	C	2137±144.4	737±29.8	66
4	D	987±20.9	1862±249.2	-157
3	E	1266±23.0	3250±268.6	-157

The study showed that resistance to albendazole, levamisole and ivermectin was critical and severe in the two farms. This indicated that the nematodes had already developed resistance to the drugs considering it the choosing drugs of practice of the farms. Seldom use of anthelmintics make it more susceptible. Furthermore, in both of the farm conducted the trial, the anthelmintics drugs used (Albendazole, Levamisole, and Ivermectin) are often being given to the animals in the past as the agent of anthelmintic. Factors that might influence the effectiveness of the drugs include the tendency of the worms to develop resistance towards anthelmintic as it can be genetically transferred through a parasite population. Resistance does not occur suddenly but develop slowly from the herd and graduate quickly as the genes are dispersed throughout the population until it tarnishes the effectiveness of the anthelmintic. In this regards, some research have shown that the extensive use of anthelmintic especially ivermectin has led to a worldwide spread of resistance in different countries [20].

4.0 CONCLUSION

In conclusion, two farms revealed the resistance of nematode to Albendazole, Levamisole, and Ivermectin anthelmintic drugs. This study suggested that the anthelmintic treatment is unlikely to be the suitable method of controlling nematode population, thus studies are needed to investigate further on the effectiveness of other methods of control such as the use of herbs.

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