Nematode resistance to common anthelmintics in naturally infected goats flocks of coastal Tamil nadu, India

A Varadharajan

Division of Animal husbandry, Faculty of Agriculture, Annamalai University, Annamalai Nagar – 608 002. Tamil Nadu, India. Email: varadharajanah@gmail.com

ABSTRACT

Faecal egg count reduction tests were conducted on goat flocks in Cuddalore, Tamil Nadu, India, to determine the efficiency of fenbendazole, levamisole and ivermectin given at recommended doses against nematode parasites. Untreated mixed sex, 5-15 mth old goats were naturally infested on pastures for 2 months. After, faecal egg counts were done on day 0 before treatment and 10 days later. At day 0 all goats were positive to parasites but by day 10, fenbendazole had reduced egg counts 74 to 91%, levamisole 90% and ivermectin 96 to 99% in the areas. Post-treatment fenbendazole and levamisole fecal culture revealed Haemonchus contortus larvae. Findings show that resistance occurred mainly in organized farms with intensive anthelmintic treatment schedules, not in small farms. Results suggest that resistance to fenbendazole and/or levamisole could have developed due to prolonged intensive under dosing. Ivermectin has only been recently used in the area and its use is not widespread.

KEY WORDS: Anthelmintic resistance, goats, Cuddalore)

*part of the PhD work done by the author.

*Corresponding author:

A Varadharajan

Division of Animal husbandry, Faculty of Agriculture, Annamalai University, Annamalai Nagar – 608 002. Tamil Nadu, India. Email: varadharajanah@gmail.com
INTRODUCTION

Anthelmintic resistance (AR) has appeared in small ruminants during past decades. AR is of greater concern in goats than in sheep because goats have a higher metabolic rate and require higher dose rates of drugs. The immune system of goats is also different. The modern broad-spectrum anthelmintics are currently used in prophylaxis and treatment of helminth infections in farm animals. Anthelmintics can induce parasite resistance due to traditional treatment, over usage, low protein diet and inadequate dose levels.

Antihelmintic resistance can be assessed through in vivo critical and controlled anthelmintic test and faecal egg count reduction test or in vitro egg hatch and larval development assays. The faecal egg count reduction test (FECRT) is recommended by the World Association for the Advancement of Veterinary Parasitology (WAAVP) and is the test of choice especially in the survey for resistance. We report status of Fenbendazole, Levamisole and Ivermectin resistances in gastrointestinal nematodes in goat flocks from the Cuddalore district, Tamil Nadu, India.

MATERIALS AND METHODS

The study was conducted in six small holder goat flocks of Chidambaram, Kattumannarkoil, Cuddalore, Panruti, Vridhachalam and Tittakudi taluks of Cuddalore district. One goat flock from each taluk was selected based on good management and having more than 60 animals. Cuddalore district is located between 11°11' to 12°35' North latitude and 78°38' to 80° East Longitude and is predominately an agricultural district. Average elevation of the district is 1 m (3 ft) above Mean Sea Level.

The selected goats were of mixed sex and of 5 to 15 months of age. The age of individual goats was determined from birth register maintained in the farm and also by dentition. Each goat was identified using a numbered ear tag. The selected goats were grouped in to four each group consisting of 15 animals in all the field flocks. None of the goats received any anthelmintic two months before the start of the experiment. The goats were then naturally infected on pastures. Faecal egg counts expressed as egg per gram was done on day 0 before treatment and then 10 days after treatment with anthelmintics. The drugs and doses given to the goats are illustrated on Table 1 below.

<table>
<thead>
<tr>
<th>Group</th>
<th>Drugs</th>
<th>Company</th>
<th>Dose (mg / kg BW)</th>
<th>Route of Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Fenbendazole</td>
<td>Intervet India Pvt Ltd</td>
<td>7.5</td>
<td>per os</td>
</tr>
<tr>
<td>II</td>
<td>Levamisole Hydrochloride</td>
<td>Virbac Animal Health India Pvt Ltd</td>
<td>22.5</td>
<td>per os</td>
</tr>
<tr>
<td>III</td>
<td>Ivermectin Oral solution</td>
<td>Virbac Animal Health India Pvt Ltd</td>
<td>2.5 ml / 10 kg BW</td>
<td>Per os</td>
</tr>
<tr>
<td>IV</td>
<td>Control</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Rectal faecal samples were collected on day 0 before treatment and day 10 after treatment. 10 gm of samples were obtained from each goat by digital rectal extraction and then immediately placed in a plastic bag. The bag was air tightened as close to the feces samples as possible. The simple test tube flotation method (FEC) was used to detect nematode eggs. Identification of nematode eggs was done as described by Soulsby, 1982. FEC were determined as number of eggs per gram for each sample using a modified McMaster technique. The detection level of the McMaster method used was 100 epg.

The EPG of strongyle-type nematodes were subjected to the faecal egg count test (FECRT), to estimate anthelmintic efficiency faecal egg counts were used to calculate the percentage efficacy of each anthelmintic using the following formula:

\[ \text{FECR} = \left\{ 1 - \left[ \left( \frac{T_2}{T_1} \right) \times \left( \frac{C_2}{C_1} \right) \right] \right\} \times 100 \]

Where \( T_1 \) and \( T_2 \) are pre-and post treatment arithmetic means of the egg per gram in treated groups, and \( C_1 \) and \( C_2 \) are pre-and post-treatment arithmetic means of the egg per gram in the control group. Efficacy of each anthelmintic was tested and interpreted according WAAVP recommendations [4]. Reduction in efficiency and presence of anthelmintic resistance is considered to exist if the FECRT percentage of an anthelmintic is < 95%.

Coproculture was done on pooled pre-treatment samples and post treatment samples for identifying the species of infecting nematodes. Mature third stage larvae were identified based on morphological characters 22.

Data were analysed statistically for reduction in egg counts by the RESO programme. Reduction in egg counts from <90% to <95% confidence limit is indicative of resistance against the drug 9.

RESULTS AND DISCUSSION

All goats were infested by GI nematodes at day 0 of screening. Examination by 10 days after treatment was used to calculate egg reduction in faecal samples (Table 2). All field flocks had developed resistance to fenbendazole of 74, 88, 90, 90, 91 and 91 in Chidambaram, Kattumannarkoil, Cuddalore, Panruti, Vridhachalam and Tittakudi areas respectively. Low resistant to Levamisole was found in field flocks of Chidambaram, Cuddalore, Vridhachalam and Tittakudi. Resistance to fenbendazole could be attributed to the prolonged and intensive use of the drug over the years. The drug is being widely used by the farmers for deworming their livestock even without proper veterinary advice, often leading to under dosing. In the present study, ivermectin was found effective with a percent egg count reduction of 96–99 per cent in all the goat farms of Cuddalore.
district. This can be attributed to the fact that the use of oral ivermectin for deworming has been introduced only recently and its use is not widespread.

From the results on Table 2, fenbendazole at the recommended dose was not effective against gastrointestinal nematodes at the field goat flocks of Cuddalore district. Similarly, levamizole was not effective against GI nematodes of field goat farms in certain taluks of Cuddalore district. The post-treatment (fenbendazole and levamizole) larval culture revealed the presence of *Haemonchus contortus* larvae. Anthelmintic resistance occurs mainly in organized farms with intensive anthelmintic treatment schedules. Resistant GI nematodes from these farms can be transmitted to smaller farmers’ flocks. Anthelmintic resistance from small holder farmers’ flocks are rare or uncommon, but if the present use of anthelmintics is continued, the situation could become unmanageable.

Thus the detection of anthelmintic resistance in small holder farmers’ flocks is significant and warrants implementation of proper anthelmintic treatment strategies to check further development of resistance. It clearly demonstrated that the goats in the coastal areas of Tamil Nadu have retained resistance to both Fenbendazole and Levamisole as a result of frequent and routine usage. Withdrawing that type of anthelmintic from use and replacing it with an alternate drug along with suitable grazing methods could be the need of this hour.
2. Mean faecal egg counts and faecal egg count reduction values on pre and post anthelmintic treatments in goats.

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Smallholder flocks</th>
<th>Anthelmintic</th>
<th>Mean faecal egg count (EPG)</th>
<th>Mean faecal egg count in control group (EPG)</th>
<th>FECR (%)</th>
<th>95% confidence limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>before treatment</td>
<td>after treatment</td>
<td>before treatment</td>
<td>after treatment</td>
</tr>
<tr>
<td>1.</td>
<td>Chidambaram Taluk</td>
<td>FBZ</td>
<td>1540±50.30</td>
<td>406.66±34.20</td>
<td>1786.66±48.30</td>
<td>2133.33±53.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1786.66±96.2</td>
<td>160±22.13</td>
<td>1920±84.03</td>
<td>73.33±15.13</td>
</tr>
<tr>
<td>2.</td>
<td>Kattuman Narcoil Taluk</td>
<td>FBZ</td>
<td>1613.33±58.7</td>
<td>186.66±26.47</td>
<td>1680±73.67</td>
<td>2093.33±62.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1666.66±56.8</td>
<td>153.33±30.07</td>
<td>1793.33±80.4</td>
<td>66.66±16.49</td>
</tr>
<tr>
<td>3.</td>
<td>Cuddalore Taluk</td>
<td>FBZ</td>
<td>1733.33±55.9</td>
<td>166.66±39.98</td>
<td>1680±64.04</td>
<td>2253.33±93.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1660±84.39</td>
<td>166.66±29.73</td>
<td>1953.33±70.6</td>
<td>40±16.90</td>
</tr>
<tr>
<td>4.</td>
<td>Panruti Taluk</td>
<td>FBZ</td>
<td>1440±84.39</td>
<td>140±31.62</td>
<td>1106.66±46.80</td>
<td>1553.33±58.78</td>
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<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1680±72.98</td>
<td>46.66±17.10</td>
<td>1333.33±69.7</td>
<td>40±13.55</td>
</tr>
<tr>
<td>5.</td>
<td>Vridhachalam Taluk</td>
<td>FBZ</td>
<td>1220±51.70</td>
<td>106.66±18.80</td>
<td>1113.33±52.35</td>
<td>1593.33±61.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1320±54.58</td>
<td>66.66±13.04</td>
<td>1146.61±49.3</td>
<td>73.31±15.86</td>
</tr>
<tr>
<td>6.</td>
<td>Tittakudi Taluk</td>
<td>FBZ</td>
<td>1253.33±63.7</td>
<td>106.66±21.34</td>
<td>973.33±52.94</td>
<td>1513±50.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1160±54.21</td>
<td>60±13.55</td>
<td>1273.33±79.1</td>
<td>53.33±13.80</td>
</tr>
</tbody>
</table>

REFERENCES


