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ORIGINAL ARTICLE

Detection of anthelmintic resistance in sheep and goat against fenbendazole by faecal egg count reduction test

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Abstract Anthelmintic resistance against commonly used anthelmintic fenbendazole was evaluated by employing faecal egg count reduction test (FECRT) in naturally occurring gastrointestinal (GI) nematodes in the semi organized sheep and goat farms of Ludhiana and Amritsar districts. A total of 80 animals (20 each for sheep and goat in both districts) were randomly selected and their faecal samples were examined by qualitative and quantitative parasitological techniques. Results indicate presence of high level of resistance against fenbendazole in both sheep and goat population of Ludhiana and Amritsar districts. More resistance was observed in the GI nematodes from animals reared in Amritsar district as compared to Ludhiana district. The level of anthelmintic resistance observed was apparently more in sheep than goats.

Keywords Anthelmintic resistance · Sheep · Goats · Fenbendazole · FECRT · Punjab

Introduction

Sheep and goat rearing has been a major source of income especially to the marginal farmers of the country (Pathak and Pal 2008). The population of goat and sheep in India is 135.17 million and 65.06 million, respectively. The sheep and goat population of Punjab state is 1.29 lacs and 3.27 lacs, respectively (DAHD and F 2012). Gastrointestinal parasitic infection is a serious threat to small ruminant production systems. In fact, most of the economic losses caused by internal parasites are actually not due to mortality but due to associated production losses in terms of decreased milk/wool production, poor hair coat or fleece growth, cost of prevention, cost of treatment and the death of infected animals (Gwaze et al. 2009). The degree of parasitism or worm burden greatly depends on the management and hygienic conditions of the area (Singla 1995). Control of GIT parasites is mainly achieved by the use of anthelmintic drugs and it will continue to remain, as there seems to be no other alternative for helminth control in small ruminants (Sanyal 2004). The extensive use of anthelmintics for control of gastrointestinal nematodes has resulted in development of resistance to one or more of the widely used anthelmintics in many countries. (Maingi et al.1998). In addition, multiple resistance to most of the anthelmintics against gastrointestinal nematodes have also been detected in many countries (Paraud et al. 2009). There have been several reports of anthelmintic resistance from different states in India (Dhanalakshmi et al. 2003; Jeyathilakan et al. 2003; Deepa and Devada 2007; Easwaran et al. 2009), mainly from organized sheep or goat farms. The present study was envisaged to detect the status of anthelmintic resistance to the most commonly used anthelmintic viz. Fenbendazole, against gastrointestinal nematodes of sheep and goat in Amritsar and Ludhiana districts of Punjab state by faecal egg count reduction test.

Materials and methods

Study area

The study was conducted in small holder (herd size 70–80 animals), semi organized sheep and goat farms located in

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Ludhiana and Amritsar districts of Punjab state. The history taken at the time of the sampling indicated that at each farm animals were dewormed by farmers without the consultancy of the veterinarian. Particularly no regular deworming schedule was followed at both the farms. However there were separate pens for neonates and adult animals. Animals were allowed to graze during day time, however during night time they were kept in confinements. During the testing of the anthelmintic drug, the sick animals indicative of any signs were isolated from the rest of the herd.

Collection and processing of faecal samples

Freshly voided faecal pellets or per-rectal faecal samples were collected from naturally infected adult animals in 30 ml wide-mouthed plastic sample bottles. Samples were screened for the presence of gastrointestinal parasitic eggs by qualitative faecal examination using standard salt floatation technique and sedimentation method (Soulsby 1982). The positive samples were subjected to quantitative faecal examination by modified McMaster's technique (Coles et al. 1992). The animals having eggs per grams (EPG) of faeces more than 500 were selected for the study. A total of 80 animals (20 each of sheep and goat from both the district) were selected and marked for anthelmintic treatment.

Anthelmintic treatment

Animals were treated with Fenbendazole (@ 15 mg/kg body weight orally (Panacur, InterVet India).

Faecal egg count reduction test (FECRT)

To assess the resistance against fenbendazole, faecal samples were collected 14 days post treatment. The faecal egg count reduction (FECR) was estimated as per the following formula by McKenna (2006).

$$\text{FECR } \% = 100 \times (1 - [T2/T1])$$

T1 and T2 represent the mean pre- and post-treatment, respectively faecal nematode egg counts (EPGs) of treated animals.

Interpretation of results

FECR% was used to determine the presence or absence of resistance to fenbendazole. Resistance was considered present in the worm population when the faecal egg count reduction per cent is found to be less than 95 % (Coles et al. 1992).

Results and discussion

The coprological examination revealed that all the animals from both districts herds were found positive for the GIT nematodes. Majority of animals were infected with single parasitic infections of strongyle eggs (62.5 %) followed by mixed GIT parasitic infections (37.5 %) (data not shown). The pre-treatment, post treatment egg counts and the per cent reduction in the faecal egg counts are given in Table 1. The decrease in faecal egg count was much less than 95 % indicating presence of higher level of resistance against fenbendazole in both sheep and goat population of Ludhiana and Amritsar districts. However, more resistance was observed in the Amritsar district as compared to Ludhiana district as evident from less FECR in Amritsar district (37.17 and 45.33 %) as compare to later (66.99 and 86.85 %). Gastrointestinal (GI) nematodes present in sheep populations were found to be more resistant to fenbendazole as compared to GI nematodes of goats.

All the sheep selected for the study were regularly/extensively dewormed as compared to less level of anthelmintics exposure to goat population. Most of the goats selected for study were being used for meat purpose, hence routine deworming was not carried out. Further due to close grazing behaviour, sheep can efficiently feed upon even the small amount of parasites/eggs that reside on the ground, hence the GI parasites are more prevalent in sheep than goats (Waruiru et al. 2005). Hence anthelmintic treatments are frequently administered in sheep herds. These could be the possible reasons for more level of anthelmintic resistance to fenbendazole in sheep as compare to goat population in both districts.

Overall the resistance to fenbendazole could be attributed to the prolonged and intensive use of the drug over the years. Fenbendazole was the most common anthelmintic

Table 1 Detection of anthelmintic resistance to fenbendazole group in sheep and goats in Amritsar and Ludhiana districts

District	Species	Pre treatment mean EPG (±SD) (T1)	Post treatment mean EPG (±SD) (T2)	Percent reduction/faecal egg count reduction (FECRT) (%)
Amritsar	Sheep (n = 20)	1345 ± 307.37	845 ± 173.26	37.17
	Goat (n = 20)	1125 ± 288.13	615 ± 275.90	45.33
Ludhiana	Sheep (n = 20)	1030 ± 289.41	340 ± 173.89	66.99
	Goat (n = 20)	875 ± 328.63	115 ± 123.97	86.85

used by animal owners in both the districts due to its wide safety margin and ease of application. The drug is being widely used by the farmers for deworming their livestock even without proper veterinary advice, often leading to under dosing. Majority of the animals in Amritsar district were grazed at the same place (confined area) whereas animals in Ludhiana district were allowed to graze at different places (large area). Benzimidazole group of anthelmintics were more frequently used in animal farms of Amritsar district as compare to Ludhiana district farms. These could be the reasons for detection of more resistance to fenbendazole in Amritsar district as compare to Ludhiana district.

Anthelmintic treatment has been serving as the most effective mean for the control of helminth infections in small ruminants; however the indiscriminate use of anthelmintics has led to the emergence of anthelmintic resistance, which is a major constraint for nematode control throughout the world. The anthelmintic resistance to fenbendazole from organized sheep farm from various parts of India viz; Haryanar (Das and Singh 2005; Chaudhri et al. 2007), Tamil Nadu (Arunachalam et al. 2005) and Faizabad (Singh et al. 2010) has been earlier reported. There is scanty data available on detection of anthelmitic resistance in small ruminants in sheep and goats in Punjab state. Buttar et al. (2012) reported development of multiple resistance against the four class of anthelmintics viz; ivermectin, levamisole, morantel and fenbendazole against GI nematodes in sheep from an organized farm of Ludhiana district. Thomaz-Soccol et al. (2004) recorded multiple anthelmintic resistance to different anthelmintics viz; benzimidazole, imidazothiazole, ivermectin, milbemicin and closantel at the five organized sheep farms in Brazil. These drugs were being used regularly on the farms which lead to the development of anthelmintic resistance. In many other studies multiple drug resistance against GI nematodes in sheep had been reported (Yadav and Garg 2004; Das and Singh 2005; Chaudhri et al. 2007; Makvana and Singh 2009) from different regions of India.

In conclusion, the detection of anthelmintic resistance in GI nematodes of sheep and goats necessitates implementation of urgent measures to slow down the development of resistance. Animal owners should be advised to avoid unnecessary anthelmintic drug therapies and not to use the same drug for longer duration. The current study emphasizes the need to explore the status of anthelmitic resistance in other parts of region.

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