Comparative Efficacy of Anthelmintic Resistance in Goat in Sylhet, Bangladesh

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A study is conducted to determine and compare the efficacy of different anthelmintics against gastrointestinal nematodes in naturally infected goats in Sylhet goverment goat development farm. About 60 male goats are divided into four groups of 15 animals each: the 1st group served as the untreated control, the 2nd was treated with albendazole, the 3rd with levamisole and the 4th with ivermectin. Faecal samples are collected on day 0 before treatment and again day on 12 post treatment. Efficacy for each anthelmintic is determined by the Faecal Egg Count Reduction Test (FECRT). About 100% efficacy against *strongyle* and *Trichuris sp.* is recorded in goats treated with albendazole and ivermectin. On the contrary, low efficacy of 86.7% is observed in goats treated with levamisol. Likewise, low efficacy of 66.7%, 40% and 46.7% against *Moniezia sp.* is recorded in goats treated with albendzole, levamisol and ivermectin, respectively. Coprocultures from all both pre and post-treatment samples revealed the pre-dominance of *Haemonchus sp.* The results of the study showed the presence of inverse relationship between the body condition score and their respective mean EPG (R^2 = 0.99), suggesting the negative effect of parasitic load on the performance of goats. A questionnaire survey conducted to gather information on methods of control practices of nematodes of goats revealed lack of basic awareness among owners of goats about the best use and efficacy of anthelmintics. In addition, it indicated that farmers in the study area apply many practices that may lower the efficacy of anthelmintics and favor the emergence of anthelmintic resistance. Benzimidazoles group of anthelmintics were reported to be used at the most frequency followed by imidazothiazoles and the avermectins are used at lowest frequency.

Keywords: Anthelmintics, Gastrointestinal nematodes, Albendazole, Levamisol, Ivermectin, Faec`al Egg Count Reduction Test (FECRT), Strongyle and Trichuris sp., Moniezia sp., Haemonchus sp.

1. INTRODUCTION

Small ruminants are widely distributed in arid, semi desert, and humid rainforest regions in the world. Goat constitutes an important species of livestock in Asia and contributes greatly to food, rural employment, and the gross domestic product (GDP). Goat keeping is known to increase the economic status of the rural poor. However, high mortality rates as a result of infections of gastrointestinal parasites remain major constraints to small ruminant production [1]. They are kept for meat, hides, fiber and milk production.

According to FAOSTAT 2005, world goat population was almost 800 million goats, up 165% from 485 million in 1985. World goat population has been increasing about 8% to 10% per year in last twenty years. As gastrointestinal parasite infection is the most important limiting factor of goat productivity, parasitism has a highly detrimental effect on the goat industry [2]. The world livestock population is 3333.7 million now. The total livestock population in Bangladesh is, however, 64.8 million, which contributes approximately 6.5% to the GDP and 13% to the foreign currency earning. Of the total livestock population in Bangladesh [3], small ruminants represent 39.2 million (20 million goats and 19.2 million sheep). Approximately 10 million goats are reared in backyard systems by rural farmers. Although adapted to local climatic and nutritional conditions, economic production of goats is hampered by infectious and parasitic diseases coupled with inadequate management [4]. Goats are prolific, giving 2 or more kids per birth. The cheese from goat milk is well accepted globally due to its good quality. They have been reported to be a significant source of milk in many developing countries as well, including Brazil Skin is another important source of economic input [5]. Leather production from goats has become a major industry in India and other Asian countries in recent years [6]. Infectious diseases and parasitism are the main problems in backyard Black Bengal goat rearing in Bangladesh. Parasitism is thought to be one of the major factors hindering rural goat production in the country. Haemonchosis caused by *Haemonchuscontortus*in goats is associated with causing hemorrhagic anemia, hypoproteinemia, and parasitic gastroenteritis, which ultimately reduce the production potential of goats. Parasitic infection, alone or concurrently occurring with other infectious diseases, causes significant economic loss due to significant mortality, stunted growth, underweight animals, poor skin quality, and decreased milk and decreased meat production. Parasitic infection in goats also has an adverse effect on blood enzyme levels, which in turn suppresses goat production in different biological ways. The levels of acidic phosphate (ACP), alkaline phosphate (ALP), serum glutamate pyruvate transaminase (SGPT), and serum glutamate oxalate transaminase (SGOT) were reported to be increased significantly, whereas total serum protein (TSP) was reported to be significantly decreased in goats infected with parasites. Available anthelmintic efficacy trials have been conducted on goats affected with parasitic infections under the control system in Bangladesh. However, some attempts were made to explore the efficacy of anthelmintics against endoparasitic infection in backyard goats.The control of parasitic helminths in domestic animals relies largely on the use of anthelmintic drugs [7]. In Ethiopia, various anthelmintics have been used in different parts of the country for the treatment of sheep and goats helminth parasites [8,9]. Therefore, the present study was undertaken to evaluate the comparative efficacy of selective anthelmintics against parasitic infection in the Black Bengal goat of Sylhet goverment goat development farm. This study also aimed to assess the impact of those anthelmintic treatments on bodyweight gain of Black Bengal goats. The findings of this study could be used for goats reared under similar backyard systems around the world.

2. OBJECTIVES

1. To study Anthelmintic resistance in Gastro-intestinal nematodes.

2. To study the prevalence of gastrointestinal parasite.

3. EXPERIMENTAL DESIGN

After acclimatization period of 4 weeks the study goats were divided into one untreated control group and three treatment groups with 15 animals in each group by blocking based on faecal strongyle type egg count (EPG) determined on day 0 before treatment. Goats of each group were housed in isolated concrete floored pen and were fed locally dried hay throughout the study period to preclude accidental infection by parasites.

Pre-treatment EPG was determined using McMaster egg counting technique as described by MAFF-1977 [10]. The treatment groups were Albendazole, Levamisole and Ivermectin treated and untreated control. Again 12 days post treatment EPG was determined in goats treated with Albendazole, Levamisole and Ivermectin. Pooled faecal samples were also cultured for respective groups for larvae identification before and after treatment.

3.1. Farm Information

Name of farm: Govt. Goat Development farm; Date of Establishment: 1995; Location: Tilagor; Area: 26 acr; Distance from road: Attached to road; Topography: Tilla; Grazing land: Present; Housing System: Conventional; Total no of House: 8 shed; Distance from one house to another house: 45 ft; Distance from road: Beside road; No of goat in each House: 50.

Breed:- Black Bengal: Present, Jamunapari&Crossbreed: Absent

3.2. Owner Information/Care taker information

Name and designation: Nibash Chandra Paul; Educational qualifications: Livestock officer, Animal Husbandry, BAU; Duty time: 09.00AM - 05.00PM.

3.3. Managemental History

Feed: Napier, Para Anthelmintics; schedule: 2 months interval; Vaccination: PPR

3.4. Individual Information

3.4.1. Male Goat (Buck): Number of Buck: 100; Age of Bucks: 0-3 months; Kid: 17; 4-6 months: 22; 7-12 months: 34; Above 12 months: 27.

3.4.2. Female Goat (Doe): Number of Doe: 350; Age of Doe: 0-3 months; Kid: 45; 4-6 months: 75; 7-12 months: 150; Above 12 months: 80.

4. QUESTIONNAIRE SURVEY

Farmers reported that they used benzimidazoles as the most widely used anthelmintic and used Levamisole as a second most commonly drug in the area.

They administer ahthelmintics at 2 months interval. They indicated that doses of anthelmintics were determined only by visual estimation of animals' weight and their animals get treatment only about once a year. All the interviewed respondents indicated that they do not have any idea about anthelmintic rotation as a result they never rotate anthelmintic families. The interviewed private drug venders informed that they sell benzimidazoles at 89%, imidazothiazoles at 10% and avermectins at only 1% to institutional farms (Government).

Prevalence and mean EPG of gastrointestinal parasites from pretreatment samples of goats in Sylhet goverment goat development farm were given in Table 1. Examining the four groups we calculated prevalence and mean EPG. In the Albendazole group prevalence of Strongyle type and *Trichuris sp.* was 100% and *Moniezia sp.* was 33%. In the Levamisole group prevalence Strongyle type and *Trichuris sp*. was 100% and *Moniezia sp*. was 24%. In Ivermectin group prevalence Strongyle type and *Trichuris sp*. was 100% and *Moniezia sp.* was 40%, finally in the control group prevalence Strongyle type and *Trichuris sp.* was 100% and *Moniezia sp*. was 53%. Among the total 60 goat prevalence of Strongyle type and *Trichuris sp.* was 100% and *Moniezia sp*.was 37%.

Table 1: Prevalence and mean EPG of gastrointestinal parasites from pretreatment samples.

Treatment Group	**Strongyle type**		***Moniezia sp.***		***Trichuris sp.***	
	N (%)	**Mean EPG**	**N (%)**	**Mean EPG**	**N (%)**	**Mean EPG**
Albendazole	15(100)	13900	5(33)	13900	15(100)	13900
Levamisole	15(100)	13187	4(24)	13187	15(100)	13187
Ivermectin	15(100)	12260	6(40)	12260	15(100)	12260
Control	15(100)	12180	7(53)	12180	15(100)	12180
Total	60(100)		22(37)		60(100)	

Studying the pretreatment group we can see from bar diagram in Figure 1 that 51 goats out of 60 were highly infected, 6 were moderately infected and 3 found light infected with gastrointestinal parasites.

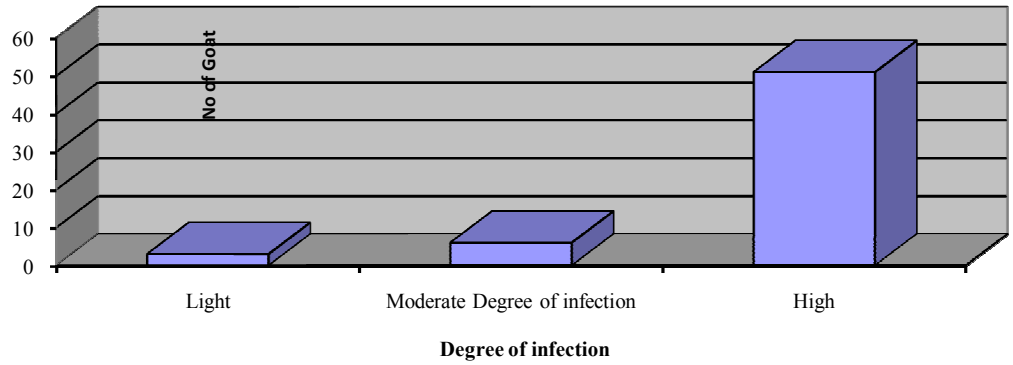

Fig. 1: Degree of infection of study goats based EPG of pretreatment faecal samples.

5. IDENTIFICATION OF PARASITE

Identification of parasitic egg from pretreatment faecal culture indicated significantly ($p<0.05$) higher proportions of *Haemonchus sp*. than the other nematodes like *Oesophagostomum* and *Trichostrongylus sp*. Whereas only *Haemonchus sp*. larvae were identified from post treatment faecal cultures in goats treated with Levamisole. The overall prevalence of strongyle type nematodes, *Moniezia,Trichuris* and *Eimeria sp*. in the pretreatment faecal samples from naturally infected study goats is very high.

By using McMaster slide we counted EPG of gastrointestinal nematode eggs by putting the number of eggs on this equation: EPG = (No. of eggs in two chambers) x 50

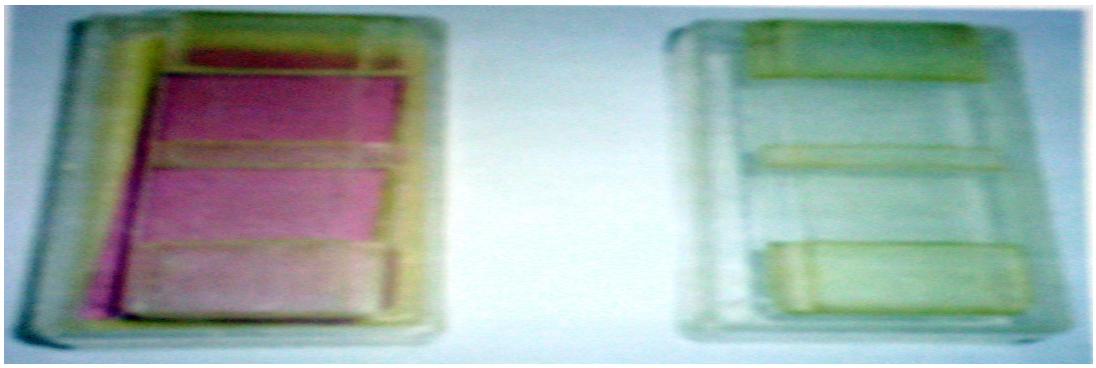

Fig. 2: Identification of gastrointestinal nematodes by McMaster Slide.

About 100% efficacy against strongyle and *Trichuris sp.* is recorded in goats treated with albendazole and ivermectin. On the contrary, low efficacy of 86.7% is observed in goats treated with levamisol as given in Table 2.

Table 2: Comparative anthelmintics efficacy of the farm against Strongyle type nematodes and Trichuris sp.

Age group (Months)	Name of the anthelmintics and its efficacy								
	Albendazole		Efficacy (%)	Levamisole		Efficacy (%)	Ivermectin		Efficacy (%)
0-3	1	15	15 (100%)	2	15	13 (86.7%)	1	15	15 (100%)
4-6	3			3			2		
7-12	6			6			8		
Above 12	5			4			4		

Low efficacy of 66.7%, 40% and 46.7% against *Moniezia sp.* is recorded in goats treated with albendzole, levamisole and ivermectin, respectively shown below in Table 3.

Table 3: Comparative anthelmintics efficacy of the farm against Monieziasp.

Age group (Months)	Name of the anthelmintics and its efficacy								
	Albendazole		Efficacy (%)	Levamisole		Efficacy (%)	Ivermectin		Efficacy (%)
0-3	1	15	10 (66.7%)	2	15	6 (40%)	1	15	7 (46.7%)
4-6	3			3			2		
7-12	6			6			8		
Above 12	5			4			4		

6. CONCLUSION

In this study the results of the current study revealed that gastrointestinal strongyle type nematodes of goats of the study area are susceptible to benzimidazoles and macrocyclic lactone families. On the other hand, Levamisole showed lower efficacy, especially against *Haemonchus sp.* in goats of the study area. However, many factors like use of drugs from black market, under dosage, misuse and inappropriate treatments may all hasten failure in efficacy of currently efficacious anthelmintics. As a result to maintain and prolong, the life span of the efficacy of available drugs farmers should be educated by proper veterinary extension about the importance of correct use of anthelmintics, annual rotations anthelmintic group and avoiding all factors that favor reduction in efficacy leading to anthelmintic resistance.

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