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Comparative efficacy of Oxfendazole and Fenbendazole in gastrointestinal Nematodosis of sheep in organized and unorganized sectors of central zone of Kashmir valley

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Abstract
The present clinical study was undertaken on the gastrointestinal nematodosis in the sheep of Ganderbal district (organized and unorganized sectors) of Kashmir valley. A total of 120 rams in the age group of 2-3years (60 in the organised sector and 60 in the un-organised sector) found positive for gastrointestinal nematodosis were selected for the therapeutic trail. The animals divided into 3 groups of 20 animals each in both sectors. Group I animals received oxfendazole @ 5mg/Kg b.wt. Single dose orally, group II received fenbendazole @ 5mg/Kg b.wt. Single dose orally, while as group III was kept as an infected control group. The therapeutic efficacy of oxfendazole was found to be 97.69% and 99.13% in organized and unorganized sectors at day 14 respectively and that of fenbendazole was found to be 68.46% and 98.26% in organized and unorganized sectors respectively.

Keywords: Gastro-intestinal Nematodosis, sheep, oxfendazole, fenbendazole

Introduction
The Jammu and Kashmir state is at 5th position with respect to sheep population in the country [1] with 5.21% share of total sheep population. Kashmir region shares 47.42% (74.994 lakh) of the total livestock population with 16.261 lakh sheep [2]. Sheep rearing is one of the incomes generating source of farmers especially of down trodden people who are getting income by way of meat and wool. The success of sheep rearing depends mainly on good health status, minimal neonatal deaths and low morbidity and mortality rates. Like other domestic animals, sheep also suffer from various viral, bacterial, parasitic and rickettsial diseases. Amongst the parasitic diseases, gastrointestinal parasitism due to nematodes is one of the major constraints for sheep production as heavy losses are inflicted in the form of morbidity, mortality, reduced feed conversion ratio (FCR) and by way of costs incurred on treatment and control. Five per cent mortality and more than ten per cent morbidity in sheep are attributable to the helminth diseases [3]. Most animals acquire mixed infection of nematode but the majority of clinical illness results from *Haemonchus contortus* infection. Modern anthelmintics like benzimidazoles are widely used in Kashmir valley. The present study was undertaken to evaluate the comparative efficacy of oxfendazole and fenbendazole in gastrointestinal nematodosis of sheep in organized and unorganized sectors of Ganderbal district of Kashmir Valley.

Materials and Methods
The present study was conducted on gastrointestinal nematodosis in sheep at the Mountain Research Centre for Sheep and Goat (MRCSG), SKUAST-K Shuhama and in three local unorganized farms of Ganderbal district. A total of 120 rams in the age group of 2-3years, (60 in the organised sector and 60 in the un-organised sector) found positive for gastrointestinal nematodosis and having EPG > 150 were selected for the therapeutic trail. Faecal samples were collected fresh per-rectally from each animal manually, the egg per gram of faeces (EPG) count was done following Stoll's technique [4] on the pre (0 day) and post treatment (7th, 14th and 28th day). The animals were divided into 3 groups of 20 animals each in both sectors. Group I animals received oxfendazole @ 5mg/Kg b.wt. Single dose orally,

Group II received Fenbendazole @ 5mg/Kg b.wt. Single dose orally, while as group III was kept as an infected control group. The therapeutic trial design was formulated as shown in the Table 1

Table 1: Therapeutic trial design

Group	Drugs	No. of sheep in each sector	Dose	Route	Treatment schedule
I	Oxfendazole (Bolus)	20	5mg/kg bwt	Orally	Single dose
II	Fenbendazole (Bolus)	20	5mg/kg bwt	Orally	Single dose
III	Infected Control	20	Untreated		

Efficacy of drugs was estimated on the basis of reduction of the mean EPG pre and post treatment using the following formula [5].

Percent efficacy = (EPG before treatment – EPG after treatment)/EPG before treatment × 100

Results and Discussion

In present study, group I animals in both the sectors (organized and unorganized were treated with oxfendazole @5mg/Kg b.wt. single dose orally. The mean EPG of group I on day 0 decreased significantly post treatment on 7th, 14th and 28th day both the sectors (Table 2 and 3). Efficacy of oxfendazole based on percent reduction in egg count at day 14 was 97.69% with upper and lower limits as 99.20 and 93.38 respectively in organized sector. However, in unorganized sector, it was 99.13% with upper and lower limits as 99.78 and 96.59. These values suggest that oxfendazole was effective against the GI nematodes of sheep in both the sectors as the criteria for efficacy i.e, FECR% is more than 95% and the 95% confidence interval is above 90 suggesting absence of resistance against oxfendazole by the gastrointestinal nematodes [6]. The high efficacy of oxfendazole in present study is similar to that observed by Chalmers (1979) [5], who recorded the efficacy of oxfendazole (5mg/kg) in sheep as 99% to 100% against all stages of *Haemonchus contortus*, *Ostealgia* species and intestinal *Trichostrongylus* species and 91% to 98% against various stages of *Nematodirus* species. Similar results were also reported by Averkin *et al*. (1975) [7], Downey (1976) [8] and Leimbacher *et al.* (1976) [9]. Since sheep metabolise and excrete oxfendazole slowly, this may be the factor responsible for its higher efficacy in sheep [10].

Both the sectors (organized and unorganized) of group II containing 20 animals each were treated with fenbendazole @5mg/Kg b.wt. Single dose orally. Mean EPG value decreased significantly on 7th, 14th and 28th day with respect to day 0 in both the sectors. Efficacy of fenbendazole based on percent reduction in egg count at day 14 was 68.46% with upper and lower limits as 74.25 and 61.36 respectively in organized sector. However, in unorganized sector, it was 98.26% with upper and lower limits as 99.25 and 95.97. These values suggest that fenbendazole is effective against the GI nematodes of sheep in unorganized sector as the criteria for efficacy i.e., FECR% is more than 95% and the lower limit of 95% confidence interval is above 90 and hence, there is no evidence of presence of resistance against fenbendazole by the gastrointestinal nematodes [6]. However, in organized sector, %FECR is less than 95% and lower limit of 95% confidence interval is less than 90 which suggests that there was presence of resistance against fenbendazole by GI nematodes of sheep in organized sector of district Ganderbal of Kashmir valley. Our results regarding the efficacy of fenbendazole in unorganized sector are in agreement with the findings of Kumar and Yadav (1994) [11], Khillare *et al*. (2002) [12] and Singh *et al* (1995) [13] who observed greater than 99.00 per cent, 97.44% and 98% reduction in faecal egg count of sheep respectively when treated with fenbendazole. Our results regarding the resistance of fenbendazole in organized sector are in consonance with the findings of sheep farm of Hisar [13, 15, 16], north western India [11] and Faizabad (Singh *et al*., 2010) [17]. The lower efficacy and resistance to fenbendazole in organized farms than in unorganized farms can be attributed to its continuous and prolonged use in controlling gastrointestinal nematode parasites in the organized farms. On the contrary, in group III animals in which no drug was used, there was significant increase in the EPG in both the sectors.

Table 2: Effect of anthelmintics on EPG in various groups of organized sector at different treatment days

Group	0 day	7th day	14th day	28th day
I	1450.00 ± 95.74^{C}	320.00 ± 32.66^{B}	30.00 ± 15.28^{A}	0.00 ± 0.00^{A}
II	1650.00 ± 95.74^{D}	900.00 ± 47.14^{C}	410.00 ± 27.69^{B}	140.00 ± 16.33^{A}
III	950.00 ± 95.74^{A}	1100.00 ± 94.28^{A}	1400.00 ± 98.33^{B}	1850.00 ± 93.47^{C}

Values within a row having Similar superscript do not differ significantly (P>0.05)

Table 3: Effect of anthelmintics on EPG in various groups of unorganized sector at different treatment days

Groups	0 day	7th day	14th day	28th day
I	2450.00 ± 95.74^{C}	650.00 ± 34.16^{B}	20.00 ± 13.33^{A}	0.00 ± 0.00^{A}
II	1750.00 ± 93.68^{C}	610.00 ± 27.69^{B}	40.00 ± 16.33^{A}	0.00 ± 0.00^{A}
III	1950.00 ± 95.74^{A}	2100.00 ± 94.28^{A}	2450.00 ± 99.36^{B}	2700.00 ± 95.22^{C}

Values within a row having Similar superscript do not differ significantly (P>0.05)

Conclusions

Efficacy of Oxfendazole @ 5mg/Kg b.wt. was highest in both sectors followed by Fenbendazole @ 5mg/kg b.wt, it is recommended to use Oxfendazole @ 5mg/kg bwt in sheep for treatment of Gastrointestinal nematodosis in both the sectors. The presence of resistance in the organized sector against fenbendazole might be due to non-judicious use of anthelmintics which leads to development of resistant strains while as the greater efficacy of anthelmintics in unorganized sector was due to non-practising of deworming programmes which leads to least exposure of parasites to anthelmintics and hence prevents development of resistance.

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