

*Original Research***Status of Anthelmintic Resistance against Gastrointestinal Nematodes in Small Ruminants of Bhiwani District (Haryana)****Priyanka¹, Sukhdeep Vohra^{2*}, Satyavir Singh³ and Arun K. Sangwan⁴**

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Abstract

Sixty sheep and 60 goats of Bhiwani district, Haryana with eggs per gram of more than or equal to 150 were divided into four groups of 15 animals each. Group I, II and III were dosed with fenbendazole, morantel and ivermectin, respectively in sheep and double dose in goats. Group IV served as untreated control. Faecal egg count on day of treatment (0 day) and 12th day post treatment were determined by the modified McMaster technique. Results revealed that fenbendazole, morantel and ivermectin in sheep reduced the faecal egg counts by 100% indicating susceptibility. In goats, fenbendazole and ivermectin reduced the faecal egg count by 100% and 98.44%, respectively indicating susceptibility. Morantel caused 95.31% reduction with lower confidence levels 86.26% indicating suspected resistance. Thus, the present study revealed that fenbendazole, morantel and ivermectin were effective against gastrointestinal nematodes in sheep and goats of unorganized sector in Bhiwani district, Haryana.

Key words: Anthelmintic Resistance, Fenbendazole, Ivermectin, Morantel, Sheep**How to cite:** Sheoran, P., Vohra, S., Singh, S., & Sangwan, A. (2019). Status of Anthelmintic Resistance Against Gastrointestinal Nematodes in Small Ruminants of Bhiwani District (Haryana). *International Journal of Livestock Research*, 9(10), 120-126- . doi: 10.5455/ijlr.20190726070911**Introduction**

Small ruminant sector is an integral part of Indian farming especially in arid, semi-arid and mountainous areas (Kumar and Roy, 2013). On an average, 15% of households in rural areas rear sheep/goat across the country and around 70% of these animals are reared by small and marginal farmers as well as landless labourers, playing an important role in their nutrition, supplementary income and livelihood security (CSWRI, VISION-2050). 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 135.2 million and 65.07 million, respectively (19th livestock census, 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 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 gastrointestinal parasites is mainly achieved by the use of anthelmintic drugs and it will continue to remain, as there seems to be no other practical 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). The present study was envisaged to detect the status of anthelmintic resistance to the most commonly used anthelmintics viz. Fenbendazole, morantel and ivermectin against gastrointestinal nematodes of sheep and goat in Bhiwani district of Haryana state by faecal egg count reduction test.

Materials and Methods

A study was conducted at unorganized farm in Bhiwani district of Haryana to determine the efficacy of anthelmintics against gastrointestinal nematodes of sheep and goats using faecal egg count reduction (FECR) test. Sixty sheep at Kairu village and 60 goats at Loharu, in Bhiwani district, which were naturally infected with gastrointestinal nematodes and having eggs per gram (EPG) of faeces > 150 counts prior to treatment were used. The selected animals had not been administered any anthelmintic during the previous two months. These animals were weighed, identified, their EPG estimated and divided into four groups of 15 animals each on the basis of EPG counts. Group I, II and III were dosed with fenbendazole (FENAZOL-150® tablets, Concept Pharmaceuticals Ltd., Animal Health Division, Mumbai) @ 5 mg/kg b.wt. orally, morantel (Banminth® Tab., Boehringer Ingelheim India Private Ltd. Mumbai) @ 10 mg/kg b.wt. orally and ivermectin (Trumectin®, Zydus Animal Health Ltd., Ahmedabad) @ 0.2 mg/kg b.wt. subcutaneously, respectively in sheep and double dose of these anthelmintics was administered in goats (Silvestre *et al.*, 2002). Group IV served as untreated control.

Faecal egg count of each animal was ascertained on 0 day and 12th day post treatment (PT), by the modified McMaster technique to an accuracy of one egg counted representing 50 EPG. Pooled faecal cultures at 27 ± 2°C for 7 days were made to recover infective larvae (L3), from each group on day 0 and 12th day PT. The infective larvae were identified as per criteria of Keith (1953). Faecal egg count reduction percentage and confidence intervals (95%) were determined following the method of the World Association for the

Advancement of Veterinary Parasitology using arithmetic mean egg counts (Coles *et al.*, 1992). The drug was considered fully effective when they reduced the egg counts by more than 95% and lower confidence limits were higher than 90%. Resistance was considered to be present, if the egg count reduction following treatment was less than 95% and the 95% confidence limit was less than 90%. Suspected resistance was considered when either of the above mentioned criteria was met. All the recorded data was statistically analyzed by one way ANOVA test (SPSS software version 2.0).

Results and Discussion

Availability of Different Breeding Services

Faecal egg counts (Mean \pm S.E.) on 0 and 12th day post-treatment (PT), percent reduction in faecal egg counts (FECR%), variance, upper and lower confidence limits (95%) of sheep and goats naturally infected with gastrointestinal nematodes and treated with different anthelmintics at Kairu village and Loharu in Bhiwani district are given in table 1 and table 2, respectively. Results revealed that fenbendazole, morantel and ivermectin reduced the faecal egg counts by 100% on 12th day PT with upper and lower confidence levels as 100% indicating that these drugs were fully effective against gastrointestinal nematodes in sheep.

In goats, fenbendazole reduced the faecal egg counts by 100%, while ivermectin caused 98.44% reduction in faecal egg counts with upper and lower confidence levels as 99.52% and 94.88%, respectively indicating susceptibility to fenbendazole and ivermectin. Morantel caused 95.31 % reduction in faecal egg counts with upper and lower confidence levels as 98.40% and 86.26%, respectively indicating suspected resistance. The susceptibility of fenbendazole against GI nematodes has also been reported by Elliot (1987) in goats of New Zealand, Sisodia *et al.* (1996) in sheep of Rajasthan, Khillare *et al.* (2002) in sheep of Maharashtra. However, resistance against fenbendazole in sheep was reported in Fatehabad district, Haryana by Vohra *et al.* (2019). The susceptibility of ivermectin has been reported by Kumsa *et al.* (2010), Sheferaw *et al.* (2013), Terefe *et al.* (2013), Kumar *et al.* (2017) and Islam *et al.* (2018). The susceptibility of morantel has been reported by Das and Singh (2010), Singh *et al.* (2012) and Sharma *et al.* (2015). Suspected resistance or likely to become resistant against morantel in this flock indicates the need to be vigilant while using this anthelmintic (Singh and Gupta, 2010). History revealed that goats were treated with morantel citrate by farmers since long, depending upon need and availability of anthelmintic but no record was maintained.

Table 1: Response to various anthelmintics in sheep naturally infected with gastrointestinal nematodes at Kairu village, Bhiwani

Group	Anthelmintic	Dose (mg/kg)	No. of sheep treated	Route of administration	Faecal egg counts on days (Mean ± S.E.)		Faecal egg counts reduction on day 12 post treatment		Confidence limits at 95%	
					0	12	%	Variance	Upper	Lower
I	Fenbendazole	5	15	Oral	1480 ^a ± 107.44	0 ^b ± 0	100	0	100	100
II	Morantel	10	15	Oral	1693.33 ^a ± 129.27	0 ^b ± 0	100	0	100	100
III	Ivermectin	0.2	15	S/C	1793.33 ^a ± 158.1	0 ^b ± 0	100	0	100	100
IV	Control	---	15	---	1746.67 ^a ± 96.54	1560.00 ^a ± 87.72	0	---	---	---

Means with same superscripts in column are not significantly different ($p < 0.05$)

Table 2: Response to various anthelmintics in goats naturally infected with gastrointestinal nematodes at Loharu, Bhiwani

Group	Anthelmintic	Dose (mg/kg)	No. of goats treated	Route of administration	Faecal egg counts on days (Mean ± S.E.)		Faecal egg counts reduction on day 12 post treatment		Confidence limits at 95%	
					0	12	%	Variance	Upper	Lower
I	Fenbendazole	10	15	Oral	1486.67 ^a ± 104.59	0 ^b ± 0	100	0	100	100
II	Morantel	20	15	Oral	1566.67 ^a ± 106.76	80.00 ^b ± 41.63	95.31	0.28	98.40	86.26
III	Ivermectin	0.4	15	S/C	1640.00 ^a ± 92.48	26.67 ^b ± 15.33	98.44	0.34	99.52	94.88
IV	Control	---	15	---	1633.33 ^a ± 111.13	1706.67 ^a ± 120.11	0	---	---	---

Means with same superscripts in column are not significantly different ($p < 0.05$)

The coproculture of pooled faecal cultures of infective third stage larvae in different groups and untreated control on day 0 and 12 (PT) of sheep and goats are depicted in Table 3. A total of 100 infective larvae in each group were counted. The result showed different genera of GI nematodes of sheep and goats with the predominance of Haemonchus spp. (86-91%) followed by Strongyloides sp. (4-9%), Trichostrongylus sp. (2-5%) and only 1-2% Oesophagostomum spp. larvae in all the treatment and untreated control groups on day 0. After 12 days of treatment, no larvae was recovered in treated sheep and goats.

No anthelmintic resistance was detected against gastrointestinal nematodes of sheep and goats except morantel in sheep in which lower confidence limit was 86.26% i.e. less than 90%, indicating suspected resistance or likely to become resistant. It may be because of very less use of anthelmintics. In addition, no regular deworming schedule was being followed by farmers in Kairu and Loharu and the individual sheep and goat and not the whole flock were treated, as and when they showed symptoms of parasitic disease. This practice by illiterate farmers is in agreement with the latest recommendation i.e. FAMCHA system (Malan and Van Wyk, 1992; Bath *et al.*, 1996; Van Wyk *et al.*, 1997). Moreover, there were no organized pastures and sheep and goats were grazed on free ranging system based on availability of post-harvested fields, barren lands, uncultivated lands during rain fed season, road and railway line side lands etc. Regular monitoring for anthelmintic resistance is essential for unorganized sector to determine the effectiveness of



anthelmintics before their use, where resistance has not already emerged. This in turn will help in taking timely measures to prevent or to delay the development of anthelmintic resistance by minimum anthelmintic usage. Detection of suspected resistance against morantel in goats at Loharu requires higher vigilance while using this anthelmintic.

Table 3: Anthelmintic effect on different genera of gastrointestinal nematodes of goats at Loharu and sheep at Kairu village, Bhiwani

Group	Species	Sheep		Goat	
		Per cent larval composition on day		Per cent larval composition on day	
		0	12	0	12
I- Fenbendazole	<i>Haemonchus</i> spp.	87	0	86	0
	<i>Trichostrongylus</i> spp.	4	0	3	0
	<i>Oesophagostomum</i> spp.	2	0	2	0
	<i>Strongyloides</i> sp.	7	0	9	0
II- Morantel	<i>Haemonchus</i> spp.	90	0	87	0
	<i>Trichostrongylus</i> spp.	5	0	5	0
	<i>Oesophagostomum</i> spp.	1	0	1	0
	<i>Strongyloides</i> sp.	4	0	7	0
III- Ivermectin	<i>Haemonchus</i> spp.	91	0	89	0
	<i>Trichostrongylus</i> spp.	2	0	4	0
	<i>Oesophagostomum</i> spp.	1	0	1	0
	<i>Strongyloides</i> sp.	6	0	6	0
IV- Control	<i>Haemonchus</i> spp.	89	89	88	88
	<i>Trichostrongylus</i> spp.	5	4	5	5
	<i>Oesophagostomum</i> spp.	1	1	1	0
	<i>Strongyloides</i> sp.	5	6	6	7

Conclusion

The present study concluded that there was no anthelmintic resistance against gastrointestinal nematodes of sheep and goats of Bhiwani district for fenbendazole, ivermectin and morantel at the recommended dose. While studying the anthelmintic resistance the values of percent reduction in egg count should also be correlated with upper and lower confidence limit as the lower confidence limit was 86.26% i.e. less than 90%, in goats against morantel in which indicating suspected resistance or likely to become resistant.

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