

ANTHELMINTIC RESISTANCE IN TRICHOSTRONGYLIDS OF SMALL-HOLDER SHEEP PRODUCTION SYSTEM IN SOME AREAS OF HARYANA

A. K. SANGWAN¹, N. SANGWAN² and S. K. GUPTA

Department of Veterinary Parasitology, College of Veterinary Sciences
CCS Haryana Agricultural University, Hisar-125 004

ABSTRACT

Anthelmintic resistance was investigated using the faecal egg count reduction test in sheep flocks of three villages of Bhiwani district and four villages of Jind district of Haryana during 2004-05 involving 547 sheep owned by small-holder landless shepherds. The anthelmintics used in these trials were fenbendazole and tetramisole hydrochloride, both of which have been in use for over last 25-40 years. Resistance was accepted if the post-treatment per cent reduction in egg count was less than 95% in the treated group as compared to the control group and secondly the 95% confidence level was less than 90%. Out of the seven flocks of sheep, trichostrongylids of the five flocks showed resistance to fenbendazole and six flocks to tetramisole hydrochloride. The predominant parasite species, detected by the larval cultures, was *Haemonchus contortus* (80%) followed by *Trichostrongylus* (17%) and rest of the parasites were *Bunostomum* and *Strongyloides*.

Key words: Anthelmintic resistance, sheep, faecal egg count reduction test, Haryana state

Majority of the sheep population in Haryana is owned by small-holder landless shepherds of low socioeconomic strata practising traditional extensive sheep rearing by exploiting local natural resources. Although anthelmintic treatment is given to such flocks in the event of clinical parasitic gastroenteritis, yet most of the anthelmintic resistance trials have been reported from the organized farms (Yadav, 1990, Yadav *et al.*, 1995, Singh *et al.*, 1996, Singh and Yadav, 1997, Swarnkar *et al.*, 1999, Gupta *et al.*, 2003) and thus the status of such rural flocks remained unknown. Parasitic gastroenteritis caused by nematode infections is a common condition of small ruminants in India. Common parasites involved are *Haemonchus*, *Trichostrongylus*, *Strongyloides*, *Bunostomum*, *Gaigeria*, *Oesophagostomum*, *Trichuris* (Gupta *et al.*, 1988). The mainstay of the disease control is use of anthelmintics. However, their indiscriminate use has resulted in development of multiple resistance as it threatens the survival of small ruminant farming (Sanyal, 2004). Two most commonly used anthelmintics are fenbendazole and tetramisole hydrochloride

which were assessed for their anthelmintic resistance status in this study.

MATERIALS AND METHODS

Between October 2004 and June, 2005, a survey was undertaken in Bhiwani and Jind districts of Haryana to assess anthelmintic resistance against trichostrongylids in sheep. The sheep flocks were raised by open grazing on the common pastures, wastelands, fallow lands, reserved lands on both sides of roads, canals etc. The drugs assessed for the resistance viz. fenbendazole and tetramisole hydrochloride, were being used by the shepherds in this area for the last 25-40 years. The dosages given were as recommended by the manufacturers.

Faecal samples of sheep from various villages of the two districts were collected, processed quantitatively and checked for their parasitic burden and suitability for the trial by finding out eggs per gram of faeces (e.p.g.) using the modified McMaster Technique (MAFF 1977). A total of seven flocks, each having more than 150 e.p.g., were selected for the trial. Four trials were conducted in Danoda Khurd, Rajpura Bhain, Dablain and Jajanwala villages of district

¹ Corresponding author

² Department of Veterinary Biochemistry

Jind involving 315 sheep and three trials involving 232 sheep were conducted in Barwa, Jamalpur and Jatu Luhari villages of district Bhiwani. Anthelmintic resistance was detected using faecal egg count reduction test as per Coles *et al.* (1992). Resistance was accepted if (i) the post treatment per cent reduction in egg count was less than 95% in the treated group as compared to the control group, (ii) the 95% confidence level is less than 90%. For species identification, representative faecal cultures were prepared from one village each of both the districts. A minimum of 100 larvae were identified from the pre-treatment cultures (MAFF, 1977).

RESULTS AND DISCUSSION

Out of the seven field trials conducted to study resistance against fenbendazole, worms of the one flock from village Danoda Khurd of Jind were fully susceptible while the worms of the flock from village Rajpura Bhain of Jind

were suspected of resistance as the lower limit of the 95% confidence level was less than 90% (Table 1). The sheep worms of rest of the villages i.e. Dablain and Jajanwala from Jind and Barwa, Jamalpur and Jatu Luhari from Bhiwani showed resistance to this drug. Only sheep worms of Jajanwala, Jind were highly susceptible to tetramisole hydrochloride treatment, while the worms of all other flocks from both the districts showed resistance.

Anthelmintic resistance has already been reported to fenbendazole, tetramisole and other benzimidazoles against sheep nematodes in various organized sheep farms (Yadav, 1990, Yadav *et al.*, 1995, Singh *et al.*, 1996, Singh and Yadav, 1997, Swarnkar *et al.*, 1999, Yadav and Garg, 2004). However, the present study confirms the existence of resistance against fenbendazole and tetramisole hydrochloride in rural unorganized small sheep flocks. Resistance against anthelmintics is least expected in such small flocks as dewormers are not regularly used and the nematode

Table 1
Post-treatment faecal egg count reduction in sheep naturally infected with gastrointestinal nematodes in Jind and Bhiwani districts

Name of the village (district)	Sheep groups	Mean e.p.g.	FECR		UCL	LCL
			Per cent	Variance reduction		
Danoda Khurd (Jind)	T1 (n = 21)	0	100	-	-	-
	T2 (n = 19)	147	84*	0.31	95	50
	C (n = 14)	918	-	-	-	-
Rajpura Bhain (Jind)	T1 (n = 23)	17	97	0.57	99	86
	T2 (n = 25)	162	72*	0.20	89	30
	C (n = 30)	577	-	-	-	-
Dablain (Jind)	T1 (n = 30)	32	85*	0.14	93	67
	T2 (n = 25)	78	62*	0.10	80	29
	C (n = 25)	286	-	-	-	-
Jajanwala (Jind)	T1 (n = 33)	42	92*	0.11	96	80
	T2 (n = 26)	6	99	0.32	100	96
	C (n = 25)	520	-	-	-	-
Barwa (Bhiwani)	T1 (n = 25)	32	86*	0.10	93	72
	T2 (n = 25)	56	75*	0.09	86	54
	C (n = 30)	223	-	-	-	-
Jamalpur (Bhiwani)	T1 (n = 26)	87	83*	0.07	90	71
	T2 (n = 26)	112	78*	0.06	87	64
	C (n = 25)	518	-	-	-	-
Jatu Luhari (Bhiwani)	T1 (n = 25)	62	70*	0.07	83	48
	T2 (n = 25)	72	66*	0.06	79	43
	C (n = 25)	210	-	-	-	-

T1- Treated with fenbendazole @ 5mg/ kg b.wt. orally, once, T2- Treated with tetramisole hydrochloride @15mg/ kg b.wt. orally, once, C- Untreated control, e.p.g.- Egg per gram of faeces, FECR- Faecal egg count reduction, UCL- Upper confidence limit at 95%, LCL- Lower confidence limit at 95%, *Resistant

Table 2
Larval composition in faecal cultures from Jind and Bhiwani districts in Haryana

Location	Larval composition (%)			
	<i>Haemonchus</i>	<i>Trichostrongylus</i>	<i>Strongyloides</i>	<i>Bunostomum</i>
Danoda Khurd (Jind)	77.0	20.0	1.0	2.0
Jamalpur (Bhiwani)	83.4	14.3	nil	2.3

parasite population is not closed one as in an organized farms where grazing is done on permanent pastures. However, use of fenbendazole and tetramisole hydrochloride over last several decades has resulted into appearance of resistance against these dewormers.

The nematode larvae recovered from coproculture of the representative faecal samples in Danoda Khurd (Jind) were *Haemonchus* (77%), *Trichostrongylus* (20%), *Strongyloides* (1.0%) and *Bunostomum* (2.0%) while the percentage of these nematodes for Jamalpur (Bhiwani) was 83.4, 14.3, 0 and 2.3%, respectively (Table 2). Gupta *et al.* (1988) have also shown predominance of *Haemonchus* and *Trichostrongylus* in Haryana. However, *Haemonchus contortus* is overwhelmingly dominant nematode parasite of sheep (Sood, 1981) and is responsible for parasitic gastroenteritis. Reports of anthelmintic resistance in *Haemonchus* from India have been summarized by Singh *et al.* (2002). The results obtained in the present study indicated that the anthelmintic resistance to fenbendazole and tetramisole hydrochloride has started appearing in the trichostrongylids of small-holder sheep production system in rural areas of Haryana. Hence, there is a need to change the anthelmintics with those having different mode of action.

Acknowledgements

The work was carried out under the state scheme, 'Studies on epidemiology, pathobiology and integrated management of animal and poultry parasites, in Western Haryana', funded by the Govt. of Haryana.

REFERENCES

- Coles, G.C., Bauer, C., Borgsteede, F.H.M., Geerts, S., Klei, T.R., Taylor, M.A. and Waller, P.J. (1992). Methods for the detection of anthelmintic resistance in nematodes of veterinary importance. *Vet. Parasitol.* **44**: 35-44.
- Gupta, R.P., Yadav, C.L. and Ruprah, N.S. (1988). Epidemiology of ovine helminthiasis in Haryana. *Trop. Anim. Hlth Prod.* **20**: 23-29.
- Gupta, S.K., Chaudhri, S.S. and Poonia, J.S. (2003). Preliminary report of closantel resistance against *Haemonchus contortus* in sheep of Western Haryana. *Indian J. Anim. Sci.* **73**: 1024-1026.
- ICAR (2002). Handbook of Animal Husbandry. Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research. Krishi Anusandhan Bhavan, Pusa, New Delhi. pp. 648-670.
- MAFF (1977). Manual of Veterinary Parasitological Laboratory Techniques, Bulletin No.18, Ministry of Agriculture, Fisheries and Food. (MAFF). Her Majesty Stationary Office, London.
- Sanyal, P.K. (2004). Is "the emperor" without clothes in farming with good worms? : Onderstepoort revisited. *J. Vet. Parasitol.* **18**: 105-108.
- Singh, D., Swarnkar, C.P. and Khan, F. (2002). Anthelmintic resistance in gastrointestinal nematodes of livestock in India. *J. Vet. Parasitol.* **16**: 115-130.
- Singh, D., Swarnkar, C.P., Srivastav, C.P., Bhagwan, P.S.K. and Dimri, U. (1996). *Haemonchus contortus* resistant to rafoxanide in sheep. *J. Vet. Parasitol.* **10**: 53-56.
- Singh, S. and Yadav, C.L. (1997). A survey of anthelmintic resistance by nematodes on three sheep and two goat farms in Hisar (India). *Vet. Res. Commun.* **21**: 447-451.
- Sood, M.L. (1981). *Haemonchus* in India. *Parasitol.* **83**: 639-650.
- Swarnkar, C.P., Singh, D., Khan, F. and Bhagwan, P.S.K. (1999). Multiple anthelmintic resistance in *Haemonchus contortus* of sheep. *Indian J. Anim. Sci.* **69**: 547-549.
- Yadav, C.L. (1990). Fenbendazole resistance in *Haemonchus contortus* of sheep. *Vet. Rec.* **126**: 586.
- Yadav, C.L. and Garg, R. (2004). Anthelmintic resistance in gastrointestinal nematodes of sheep in Haryana. *J. Vet. Parasitol.* **18**: 39-42.
- Yadav, C.L., Kumar, R., Uppal, R.P. and Verma, S.P. (1995). Multiple anthelmintic resistance to *Haemonchus contortus* in a sheep farm in India. *Vet. Parasitol.* **60**: 355-360.