BENZIMIDAZOLE RESISTANCE IN AN ORGANIZED GOAT FARM IN KERALA – A CASE STUDY

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Abstract

Faecal Egg Count Reduction Test (FECRT) was employed for the in vivo detection of benzimidazole resistance in an organized farm in Thiruvananthapuram District, Kerala. The farm had over 150 animals reared under semi intensive management which were dewormed once in two months with benzimidazoles. The percent reduction in FECRT was 60 per cent with 81 and 15 being the upper and lower 95 per cent confidence limits indicating high level of benzimidazole resistance. Coproculture on pooled fecal samples from the farm revealed that predominant gastrointestinal nematode species were Haemonchus spp. (53.73 per cent), Trichostrongylus spp. (22.39 per cent) and Oesophagostomum spp. (23.88 per cent). Haemonchus spp. was the most predominant species identified with coproculture of the post treatment samples (98 per cent). The resistance status could be correlated with the high frequency of usage of benzimidazoles in the farm.

Key words:- *Benzimidazole resistance, FECRT, goats, Haemonchus contortus*

Intensive use of benzimidazoles for the past three to four decades has led to the emergence of resistance to the drug in gastrointestinal (GI) nematodes of small ruminants. In India, the first report of anthelmintic resistance was by Varshney and Singh (1976) against phenothiazine and thiabendazole in sheep. Subsequently, development of resistance to all major classes of anthelmintics was reported from different states including Haryana, Uttar Pradesh, Rajasthan, Gujarat, Tamil Nadu, Karnataka etc (Swarnkar and Singh, 2017). Routine assessment of the resistance status in farms helps in planning optimal use of anthelmintics. Faecal egg count reduction test (FECRT) is the standard *in vivo* technique for detection of benzimidazole resistance. The present study reports benzimidazole resistance in an organized goat farm under the government sector in Thiruvananthapuram district, Kerala and its correlation with the management and deworming practices in the farm.

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Materials and Methods

The study was conducted in organized goat farm with about 150 animals reared under semi-intensive management. History of the frequency of deworming and drugs used were collected from the available records.

Fecal egg count reduction test (FECRT) was done as per the guidelines of WAAVP (Coles *et al.* 2006). Twenty kids, aged three to six months which have not been dewormed eight weeks prior to the study, were randomly allocated into two groups of ten animals each. Rectal samples were collected from all the animals and the treatment group was given albendazole suspension (Valbazen, Pfizer) @ 15 mg/kg orally. The second group was left untreated as the control group. Rectal samples were again collected on day 12 post treatment. Egg counts were made on the pre-treatment and post-treatment samples by Modified Mc master technique. Per cent reduction in the post-treatment faecal egg counts between the treatment and control groups was determined using a programme, RESO, Version 2 (Martin and Wursthom (1991). Reduction in egg counts of less than 95 per cent with lower 95 per cent confidence limit less than 90 was considered as indicative of resistance against the drug (Coles *et al*. 1992).

Coproculture was done on pooled pre treatment samples and post treatment samples for identifying the species of infecting nematodes. Mature third stage larvae were identified based on morphological characters (Van Wyk *et al*. 2004, Van Wyk and Mayhew, 2013).

Results and Discussion

Results of FECRT done to assess the benzimidazole resistance in naturally infected goat population in an organized farm are presented in the Table 1.

The results indicated the development of resistance to benzimidazoles in the farm which could be attributed to the prolonged and intensive use of the drug over the years and high frequency of treatment. Data collection on history of anthelmintic usage in the farm indicated that deworming was done once in two months and the anthelmintic used was predominantly benzimidazoles. The drug was administered based on visual estimation of body weight of animals and whole flock treatment was generally done.

Prolonged and frequent use of benzimidazoles can select for resistance as opined by Rialch *et al.* (2013), Morrison *et al.* (2014) and Iliev *et al.* (2014). As per Chagas *et al*. (2016) high frequency of drug treatment was the most important factor leading to resistance development.

Another factor that might have contributed to the development of resistance is sub dosing. Goats have rapid hepatic metabolism and lower bioavailability of drugs and they require double the dose of benzimidazoles advocated for sheep. Therefore under dosing can occur in goat flocks drenched with sheep dose of benzimidazoles leading to emergence of resistance. Consequently the problem of benzimidazole resistance is more in goat flocks than sheep flocks as reported by Niciura *et al.* (2012) and Rialch *et al.* (2013).

Whole flock treatment can significantly select for resistance as it reduces worms available in the refugia. Presence of worms in the refugia can dilute the selection pressure for benzimidazole resistance as opined by Niciura *et al.* (2012).

Table 1: Results of FECRT

	Mean post treatment EPG	Per cent FEC reduction	95 per cent Confidence limit		Status
			Lower	Upper	
Treatment group	952	60	15	81	Resistant
Control group	2370	-	-		

Gastrointestinal nematode species identified by copro-culture were *Haemonchus* spp. (53.73 per cent), *Trichostrongylus* spp. (22.39 per cent) and *Oesophagostomum* spp. (23.88 per cent). Morphological identification of the genera of infecting strongyles was done as per the keys provided by Van Wyk *et al*. (2004) and Van Wyk and Meyhew (2013) in which the length of the sheath tail in comparison with that of *Trichostrongylus* spp. and the proportion of the filament to the tail sheath were considered for identification. *Trichostrongylus* spp. had very short tail sheath which tapered sharply resembling a pencil point and absence of filament was absent. In *Haemonchus* spp. the length of the sheath tail was 2.5 times that of Trichostrongylus spp. with 10 to 15 per cent filament while in *Oesophagostomum* spp. the length of tail sheath was 5.0 times that of *Trichostrongylus* spp. and the proportion of filament was 50 per cent.

High biotic potential of GI nematodes especially *H. contortus* contributes to rapid selection for resistance as large number of generations of worms are produced within a short time (Deepa and Devada, 2007). In the present study, *Haemonchus* spp. was found to be the most predominant species in the post treatment coproculture (98 per cent) indicating that it was the major contributing species for resistance to benzimidazoles.

In conclusion, the detection of anthelmintic resistance in GI nematodes of goats in organized sectors necessitates implementation of urgent measures to slow down the development of resistance. Existence of drug resistant GI nematodes in breeding animals in farms increases the risk of dissemination of resistant strains to small holder farmers' flocks as farm bred animals are distributed to farmers (Easwaran *et al*. 2009). Periodical screening of flocks for resistance by FECRT is recommended to identify the emergence of resistance and for early implementation of management strategies.

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