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Research Article

EVALUATION OF ANTHELMINTIC EFFICACY OF HERBAL PREPARATION IN SHEEP AND GOATS AFFECTED WITH GASTROINTESTINAL NEMATODES AT AN ORGANIZED FARM OF HISAR, HARYANA

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ABSTRACT

In the present study, the anthelmintic efficacy of herbal preparation was evaluated in sheep and goats affected with gastrointestinal nematodes (GINs) by faecal egg count reduction test (FECRT). We selected 45 sheep and 45 goats having at least 150 eggs per gram (EPG) which were divided into groups of 15 each sheep and goats with control group i.e. S1, S2, and S3 and G1, G2 and G3, respectively. Group S1 and G1 was given fenbendazole (FBZ) @ 5mg/kg in sheep and 10 mg/kg in goats orally); group S2 and G2 herbal formulation "Worm-X" (@ 2.0 ml/kg in sheep and 4.0 ml/kg in goats orally). The S3 and G3 was the untreated control group. Rectal faecal samples were collected on zero (pre-treatment) and 14th day (post-treatment) from animals of all groups and EPG of faeces were carried out by modified McMaster technique. According to FECRT, efficacy of "Worm X" was 56% and 63% which was much lower than FBZ of 71% and 77% in sheep and goats farm, respectively. According to guidelines of World Association for the Advancement of Veterinary Parasitology (WAAVP), FBZ was moderately resistant and herbal preparation "Worm X" severe to moderate resistant to GINs in sheep and goats of organized farm from Hisar.

Keywords: Anthemintic resistance, Fenbendazole, Herbal preparation, Sheep and Goat

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The gastrointestinal nematodes (GINs) are the major cause for loss of health and productivity in sheep and goats industry. Sheep and goats are susceptible to GINs infections because they graze pastures and other grasslands which are contaminated with infective eggs and larvae resulting in infection and re-infection. Tropical and subtropical climate favour many GINs like *Haemonchus contortus*, *Trichostrongylus* spp., *Nematodirus* spp. and *Strongyloides papillosus*. Among these GINs, *H. contortus* is the most pathogenic, widely prevalent and important worm in sheep and goats, responsible for high morbidity and mortality (Besier *et al.*, 2016). So far, for controlling GINs, many synthetic anthelmintic drugs are used largely and repeatedly. However, the efficacy of synthetic anthelmintics has been reduced with the development of anthelmintic resistance (Balmer *et al.*, 2015; Singh *et al.*, 2019). Alternative solutions to synthetic anthelmintic treatments like herbal preparation are in trend for cost-effective sustainable control of GINs. *In vitro* and *in vivo* validation of anthelmintic property of a variety of plants has been done by many workers (Iqbal *et al.*, 2007; Sunandhadevi *et al.*, 2017). Thus, continuous evaluation of efficacy for available drugs and alternate methods are necessary for controlling these GINs. Therefore, the present study was planned to evaluate the anthelmintic efficacy of anherbal preparation"Worm X" in sheep and goats at an organized farm of Hisar, Haryana.

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MATERIALS AND METHODS

A total of 45 sheep (Corriedale cross Sonadi) and 45 goats (Beetal cross) above 3 months of age maintained at Central Sheep Breeding Farm (CSBF), Hisar and not dewormed for the last three months having EPG>150 were selected for the present experiment. These animals were divided in six groups having 15 sheep (S1, S2 and S3) and goats (G1, G2 and G3) in each and weighed and treated according to body weight on zero-day. The faecal egg count reduction test (FECRT) was carried according to the method described by the World Association for the Advancement of Veterinary Parasitology (WAAVP) (Coles *et al.*, 1992). The sheep and goats from group S3 and G3 served as negative control, respectively. Group S1 and G1of sheep and goats, respectively were treated with fenbendazole (2.5% @ 5mg/kg in sheep and 10mg/kg in goats, oral solution) (Silvestre *et al.*, 2002) while group S2 (Sheep) and G2 (Goat) were treated with herbal preparation (Worm X™, suspension @ 2.0 ml/kg in sheep and 4.0 ml/kg in goats, oral solution (Table 1). Faecal egg count of each animal was ascertained on zero and 14th day post treatment (PT) by modified McMaster technique to an accuracy of one egg counted representing 50 EPG. Pooled faecal cultures were kept at 27±2 °C for 7 days to recover infective third stage larvae from each group. 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 WAAVP using arithmetic mean egg counts. The sheep

and goat which were positive post-trail were treated with effective anthelmintic drug. The drug was considered fully effective when they reduced the egg counts by more than 95% and lower confidence limits were higher than 90%. The drug was considered moderately resistant when they reduced the egg counts between 60% to 95% and considered severely resistant when the reduction in egg counts was below 60% along with lower confidence limits below 90%. All the recorded data were statistically analyzed by one way ANOVA test using SPSS software version 27.0.

RESULTS AND DISCUSSION

According to WAAVP guidelines, GINs in sheep and goats of organized farm from Hisar, Haryana are resistant to both Fenbendazole (FBZ) and "Worm X". Data generated in detail i.e. faecal egg counts with Mean±S.E. of zero and 14th day post-treatment (PT), the percent reduction in faecal egg counts (FECR%), variance, upper and lower confidence limits (95%) of sheep and goats treated with FBZ and "Worm X" are given in Table 2. Maximum reduction in faecal egg count percentage was observed in FBZ treated groups for both sheep (S1-71%) and goats (G1-77%), whereas, in "Worm X" herbal preparation treated groups, reduced egg count in sheep and goats were 56% and 63%, respectively. Our findings differ with Waghmare *et al.* (2009) who reported 100 per cent efficacy of the similar herbal formulation against GINs in sheep on 14th day PT. The reason behind low efficacy may be due to under dosing and repeated usage in the farm. While our reports are similar to Parsani *et al.* (2020) who reported 47% to 72% efficacy on 15th day PT and low efficacy of Worm X may be due to the amount of doses and frequency of dosing, as on 30th day PT also reported 69 to 89% of reduction in egg count in sheep with different dose rate. As per WAAVP recommendations, the herbal formulation (Worm X) used in the present study may be classified as not recommended to be used as anthelmintic at the rate 2 ml/kg for sheep and 4 ml/kg for goats orally. There is a need to further study the herbal preparation (Worm X) for optimum dose rate and frequency of dose required to achieve effective control of GINs in sheep and goats.

Table 1

List of ingredients in "Worm X" herbal preparation

Sr.No.	Contents	Scientific name	Per ml
1	Kali Jeeri	(*Centratherum anthelminticum*)	6.5mg
2	Indrayan Phal	(*Citrullus colocynthis*)	3.5mg
3	Vidanga	(*Embelia ribes*)	6.5mg
4	Kampilla	(*Mallotus philippinensis*)	3.5mg
5	Ingudi	(*Balanites aegyptiaca*)	3.5mg
6	Palash seeds	(*Butea frondosa*)	3.5mg
7	Neem	(*Azadirachta indica*)	3.5mg
8	Marod Phalli	(*Helicteres isora*)	3.5mg
9	Amaltas	(*Casia fistula*)	3.5mg
10	Kalmegh	(*Andrographis paniculata*)	6.5mg

The coproculture of pooled faeces from different groups and untreated control on day 0 and 14 were performed. A total of 600 infective larvae,100 for each group (S1, S2 and S3; G1, G2 and G3) were counted. The infective larvae were identified as per the criteria of Keith (1953). The result showed different genera of GINs of sheep and goats with the predominance of *H. contortus* followed by *Trichostrongylus* spp. and *Strongyloides papillosus* larvae on day 0. After 14th days of treatment, *H. contortus* (100%) was the only species found to survive by the FBZ treatment, while for "Worm X" group, *H. contortus*, *Trichostrongylus* spp. and *S. papillosus* larvae were identified in both sheep and goats (Table 2). The strain of *H. contortus* resistant to various anthelmintic in sheep and goats has already been reported by Fleming *et al.* (2006) and Kumar and Singh (2016).

"WORM X" herbal preparation containing plant

Table 2

Pre- and post-anthelmintic (Fenbendazole) and herbal preparation (Worm X) treatment faecal egg counts of sheep and goats naturally infected with gastro-intestinal nematodes at Central Sheep Breeding Farm, Hisar

Group (Anthelmintic)	Dose and route of administration	Faecal egg counts on days (Mean±S.E.)		Faecal egg counts reduction on 14th day PT (Post treatment)		Confidence limits at 95%		Percent of larval composition on day	
		0	14	%	Variance (y^2)	Upper	Lower	0	14
Sheep-S1-Fenbendazole	5 mg/kg; Oral	587^{a}±95.55	187^{b}±63.14	71	0.15	87.06	34.58	79^{c}, 13^{d}, 8^{e}	100^{c}
Sheep -S2- Worm X	2 ml/kg; Oral	540^{a}±79.16	280^{b}±87.93	56	0.13	79.52	5.23	86, 8d, 6^{e}	88^{c}, 8^{d}, 4^{e}
Sheep -S3- Control	—	633^{a}±113.66	593^{a}±125.66	0	0	0	0	83^{c}, 11^{d}, 6^{e}	88^{c}, 9^{d}, 3^{e}
Goat-G1-Fenbendazole	10 mg/kg; Oral	813^{a}±137.96	193^{b}±56.45	77	0.12	89.68	53.33	81^{c}, 14^{d}, 5^{e}	100^{c}
Goat-G2- Worm X	4 ml/kg; Oral	806^{a}±137.13	313^{b}±94.54	63	0.14	82.22	23.41	93^{c}, 3^{d}, 4^{e}	91^{c}, 8^{d}, 1^{e}
Goat-G3- Control	—	847^{a}±147.63	846^{a}±147.63	0	0	0	0	79^{c}, 13^{d}, 8^{e}	84^{c}, 11^{d}, 5^{e}

Means with same superscripts are not significantly different (P<0.01) column-wise and c=*H. contortus*, d=*Trichostrongylus* spp. and e=*S. papillosus*

Butea frondosa also called Palash seeds have anthelmintic action by active principles- palasonin, phenolic and flavonoids in the seeds, which exerts impairment of energy and metabolism by interfering with glucose uptake and by depleting the glycogen stores in the worm (Iqbal *et al.*, 2007 and Singh *et al.*, 2015). Some components of the seed of *Centratheram anthelminticum* have been isolated and identified having bitter taste which is responsible for the anthelmintic activity (Lambertini *et al.*, 2004). Duvey (2013) reported that the aerial part of Indrayan Phal (*Citrullus colocynthis*) shows significant value for anthelminticactivity in a dose-dependent manner. Murali *et al.* (2014) reported that *Andrographis paniculata* methanolic and aqueous extracts was found to be more potent, and activities are compared with the drug piperazine citrate as a reference drug. Chothani and Vaghasiya (2011) reported that *Balanites aegyptiaca* known as 'Ingudi' as traditionally used in the treatment of various ailments including intestinal worm infection (Nkunya *et al.*, 1990). Neem (*Azadirachta indica*) aqueous extract has an anthelmintic efficacy of up to 93%, as compared to pyrantel tartrate (Rabiu and Subhasish, 2011). *Embelia ribes* is a large scandent shrub, distributed throughout India and belongs to the family Myrsinaceae. It is commonly known as Baberang in Hindi and Vidanga in Sanskrit. The dried fruits are being used for the preparation of medicine. Kekuda *et al.* (2009) reported that 3 and 5% of aqueous extract of *Embelia ribes* are more potent than the same concentrations of standard drug.

Herbal preparation "Worm X" used in the present study is not highly effective as per WAAVP guidelines for sheep and goats GINs. So, further investigations are required like the amount of dose, frequency of dose and best combination with synthetic anthelmintic etc.This continuous evaluation of efficacy of different drugs either herbal or synthetic is important to prevent the development of anthelmintic resistance in sheep and goats.

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