

***In vivo* Anthelmintic Activity of a Herbal Formulation against Naturally Acquired Gastrointestinal Nematodes in Goats**

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Abstract This article documents some anthelmintic properties of a herbal formulation (HF) prepared by mixing equal quantities of powdered seeds of *Vernonia anthelmintica*, *Artemisia maritima*, *Butea frondosa* and stem bark of *Holarrhena antidysentrica*. The FECRT was conducted as per guidelines of WAAVP. 24 goats infected with GI nematodes were divided into four groups T₁ to T₄ of six animals in each group. Group T₁ was given two doses of fenbendazole @ 10 mg/kg BW *per os* at 15 days interval. In group T₂, T₃ and T₄ herbal formulation was given @ 5 g, 7.5 g and 10 g/animal/day orally for 10 days respectively. When FECR was compared 10 days post treatment, maximum reduction (84.67%) was observed in group T₁ followed

by group T₃ (69%) and T₄ (67%). The reduction in FEC in group T₃ and T₄ at 20 days post treatment were almost equal (78%), and at 30 days post treatment were 95 and 97%, respectively while in group T₂ the reduction in FEC at 20 and 30 days post treatment was comparatively less i.e. 58.16 and 81.43% respectively. The herbal formulation used in the current study was found moderately effective at a lower dose (5g) and effective at 7.5 g and 10 g/animal dose.

Keywords *Artemisia maritima*, *Butea frondosa*, FECRT, Gastrointestinal nematodes, Goat.

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Introduction

Gastrointestinal nematodosis is a serious threat to economic and intensive goat farming. Continuous and indiscriminate use of anthelmintic has led to development of anthelmintic resistance as well as drug residues in milk and meat [1]. In developing countries like India where farmers are even not able to afford synthetic anthelmintics, herbal anthelmintic formulations can be a better way to overcome the problem of gastrointestinal nematodes as well as anthelmintic resistance.

There are some plants or parts of these which have known anthelmintic properties. In nature also,

small ruminants have the ability to identify and consume them when suffering from parasitism [2]. But scientific validation is needed for anthelmintic properties of these plants. This article documents some anthelmintic properties of a herbal formulation (HF) prepared by mixing equal quantities of powdered seeds of *Vernonia anthelmintica*, *Artemisia maritima*, *Butea frondosa* and stem bark of *Holarrhena antidysenterica*.

Materials and Methods

The seeds of *Vernonia anthelmintica*, *Artemisia maritima*, *Butea frondosa* and stem bark of *Holarrhena antidysenterica* were obtained from field and/or local market. The plant materials were identified and authenticated by the botanist in the Department of Botany, Jawaharlal Nehru Vishwa Vidyalaya, Jabalpur and were dried under shade. The seeds of *Vernonia anthelmintica*, *Artemisia maritima*, *Butea frondosa* and stem bark of *Holarrhena antidysenterica* were powdered separately by using electric mixer and grinder at low speed, and herbal formulation was made by mixing these powders in equal quantities.

The FECRT was conducted as per WAAVP guidelines for testing anthelmintics in naturally infected animals due to lack of alternative guidelines for evaluating plant anthelmintic products [3]. The number of animals recommended by the WAAVP guidelines is at least six per group. 24 goats infected with GI nematodes were divided into four groups T₁ to T₄ of six animals in each group. Group T₁ was given two doses of fenbendazole @ 10 mg/kg BW per os at 15 days interval. In group T₂, T₃ and T₄ herbal formulation was given @ 5g, 7.5 g and 10 g/animal/day orally for 10 days respectively. Modified McMaster technique was used for faecal egg counts [4]. Faecal egg count reduction (FECR) was calculated by using the following formula.

$$\text{FECR (\%)} = \frac{(\text{Pre treatment EPG} - \text{Post treatment EPG})}{(\text{Pre treatment EPG})} \times 100$$

In accordance to the recommendations of W.A.A.V.P., an anthelmintic is considered as highly

effective with FECR percentage more than 98%, effective at 90-98% FECR and moderately effective at 80-89% FECR, whilst FECR percentage less than 80 is not recommended for use.

Results and Discussion

Results of the study are shown in Table 1. When FECR was compared 10 days post treatment, maximum reduction (84.67%) was observed in group T₁ followed by group T₃ (69%) and T₄ (67%). The reduction in FEC in group T₃ and T₄ at 20 days post treatment were almost equal (78%), and at 30 days post treatment were 95 and 97%, respectively while in group T₂ the reduction in FEC at 20 and 30 days post treatment was comparatively less i.e. 58.16 and 81.43%, respectively. Waghmare et al. [5] reported 100 per cent efficacy of the same HF against GI nematodes in sheep on 13 day post treatment with 5 g/animal/day for ten days. The possible explanation for this could be higher recommended dosages for goats as compared to sheep as the goats metabolize the drugs differently and require a comparatively higher dose [6]. In the light of the W.A.A.V.P. recommendations, the herbal formulation used in the current study may be classified as moderately effective anthelmintic at a lower dose (5 g) and effective at 7.5 g and 10 g/animal dose.

The plants used in the HF have been reported for their anthelmintic activities individually in numerous studies either *in vivo* or *in vitro* [7–9]. Phytochemical studies of the ingredients of the plants have shown that the anthelmintic action of *B. frondosa* was attributed to the active principle palasonin in the seeds, which exerts anthelmintic action through impairment of energy and metabolism by interfering with glucose uptake and by depleting the glycogen stores in the worm [10]. *H. antidysenterica* possesses anthelmintic action through its high anticholinesterase activity and is considered to be a potential anthelmintic. Chopra et al. [11] reported that *A. maritima* contains santonin which exerts wormicidal action on larvae of *H. contortus*. Some components of the seed of the seed of *V. anthelmintica*, such as vernodlin, vernodalol, and vernolic acid, have been isolated and

Table 1. Comparative therapeutic efficacy of different anthelmintics at different time interval. Figures in parentheses indicate the fecal count reduction per cent.

	Groups	Day 0	Days 10	Day 20	Day 30
T ₁	Fenbendazole @ 10 mg/kg PO fortnightly × 2 doses	1500.00 ± 148.32	216.67 ± 16.67 (84.67%)	150.00 ± 67.08 (90.40%)	33.33 ± 21.08 (97.60%)
T ₂	Herbal formulation (CP) @ 5g/animal/day PO for 10 days	1341.67 ± 341.18	700.00 ± 73.03 (38.73%)	516.67 ± 84.33 (58.16%)	250.00 ± 105.67 (81.43%)
T ₃	Herbal formulation (CP) @ 7.5 g/animal/day PO for 10 days	2066.67 ± 446.97	558.33 ± 98.67 (69.18%)	416.67 ± 84.33 (78.00%)	66.67 ± 33.33 (95.24%)
T ₄	Herbal formulation (CP) @ 10g/animal/day PO for 10 days	1966.67 ± 457.29	550.00 ± 76.38 (67.98%)	350.00 ± 56.27 (78.14%)	50.00 ± 34.16 (97.28%)

identified [12,13] and are known to have bitter taste and these bitter principles may be responsible for the anthelmintic activity of *V.anthelmintica*.

In conclusion, this seems to be the first trial of this herbal formulation in goats as effective anthelmintic. Better efficacy of HF than that of the individual plants suggests some synergistic effect among the phytochemicals of the plants used. Standardization of procedures for its preparation, doses and large scale trials are recommended.

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