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Comparative efficacy of herbal and modern anthelmintics against gastrointestinal worms in goats reared in free range system of grazing

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Abstract
Gastrointestinal parasite diseases, which cause slow growth, poor reproductive performance, and mortality, are one of the key obstacles for a lucrative goat business in tropical and subtropical regions, including India. The predominant method of managing livestock parasites has been the use of synthetic anthelmintics, which may lead parasites of small ruminants to acquire resistance to these treatments. Herbal medicine is an alternative way to parasite control. For these reasons, despite therapeutic practices all over the world, interest in screening medicinal plants for anthelmintic properties has remained high. Aloe is a traditional herbal cure used to heal several ailments. Goats are bred in this study on a large grazing facility. Sixty goats of both the sexes aged between 1 to 3 years were primarily selected in this study. Out of this, thirty heavily gastrointestinal helminths infected were selected for the research. The thirty goats were divided into three groups. (Ten goats/group). Group A-Albendazole @ 10 mg/kg solution was administered orally. Group B- *Aloe vera* pulp @ 250gm/goat was administered orally. Group C-No drug was administered used as untreated as control group. Fecal samples were collected directly from the rectum of goats on day 0, 7, 14 and 28 post treatment. During this study it was also observed that there were no significant (p>0.05) changes in EPG of the animals of control group. Albendazole exhibited 100% efficacy on day 14th and 28th post treatment, whereas *Aloe vera* exhibited 100% efficacy on day 28th post treatment. Anthelmintic efficacy of Albendazole is well established and when it was compared with *Aloe vera* it has been shown that leaves of *Aloe vera* have marked anthelmintic property.

Keywords: GI parasitism *Aloe vera*, albendazole

1. Introduction
In tropical and subtropical regions, particularly India, gastrointestinal parasite diseases constitute a severe barrier to a lucrative goat business. The economic effect of Gastrointestinal parasites in the cattle business comprises both morbidity as well as mortality costs in terms of suboptimal meat and milk production, enhanced susceptibility to illnesses, carcass condemnation losses, and the cost of medications and veterinary assistance [1].
Parasitic illnesses continue to be a severe barrier to cattle production in Africa across all agricultural ecosystems and production techniques [2]. Worm infections are one of the leading causes of sluggish development, reduced reproductive efficiency, and mortality in sheep and goats [3]. Parasitic illnesses are thought to be significant in terms of producing substantial economic losses in cattle through morbidity and death. This category of gastrointestinal helminths is also related with anemia and gastroenteritis, which result in loss of body weight, stunted development, diarrhoea and other symptoms that significantly impair goat growth and production [4].
The productivity of cattle is widely acknowledged to be significantly hampered by helminths, both in the tropics and elsewhere. Regular anthelmintic therapy is the major method for controlling GI nematodes. Long thought to be the only method of managing parasite infection, imported produced anthelmintics are typically expensive and infrequently accessible to farmers living in remote locations. Additionally, the disease has gotten worse due to helminths developing resistance to several anthelmintic substances, chemical residues and toxicity issues [5].

1.1 Herbal anthelmintics

Despite the widespread use of synthetic drugs in contemporary clinical practises worldwide, screening plants with medicinal properties to determine their anthelmintic properties continues to be of significant scientific importance [6]. Nirmala jamra *et al*. (2014) [7] have concluded that anthelmintic efficacy of crude neem leaf powder against bovine strongylosis. Rahman (2002) [8] has reported that highest efficacy of neem leaves in alclholic extract whereas aqueous extract has lower efficacy than alcohol against GI nematodes in goats. Ali *et al*. (2005) [9] have reported that papaya showed its anthelmintic efficacy against *Ascaridia galli* and other helminths.

The interest in medicinal plants has increased significantly in recent years not only to cure humans but also to cure animals. There are several medicinal plants to treat different helminths in livestocks [10].

According to Shah alam *et al*. (2014) [11] reports, in addition to contemporary anthelmintics, indigenous medicinal herbs are now also employed as anthelmintics. Among them, entire korolla extract, *Azadirachta indica* leaves, and papaya seed extracts have bitter tastes and work as effective anthelmintics. By conducting *in vitro* tests on adult nematodes and developmental stage larvae (L_3) of poultry, medicinal plant compounds such as leaves of neem, neem seeds, papaya seeds, korolla (whole) and current anti-helmintics were investigated for their anthelmintic effects.

Stepek, G. *et al*. (2004) [12] reported that a particular group of compounds, the cysteine proteinases, has been mentioned as having potential for a novel group of anthelmintics, as they might damage the cuticle of nematodes. The parent compounds are present in plants such as papaya, pineapple, and figs, and have a documented effect in several host species against a variety of nematodes. However, their mode of action is not very specific, and the safety index (maximum tolerated dose/ recommended therapeutic dose) is expected to be low.

1.2 *Aloe vera* as an anthelmintic

Pankaj K Sahu *et al*. (2013) [13] reported that the majority of people utilize *Aloe vera* for food and medication, and that it is employed in ayurvedic, homoeopathic and allopathic treatment. Numerous vitamins, minerals, enzymes, amino acids, sugars that are naturally occurring, and other bioactive substances with antibacterial, antioxidant, anti-inflammatory, aphrodisiac, anti-helmenthic, fungicidal and antiseptic properties as well as aesthetic virtues exist in the plant leaves. Sikarwar Mukesh *et al*. (2010) [14] reported that aloe gel contains spermicidal, gastroprotective, anti-inflammatory, antiviral, anthelmintic, and wound healing effects. Furthermore, it has demonstrated immune-boosting and cholesterol-lowering properties.

Pradeep kumar *et al*. (2012) [15] reported that harmful bacterial growth was successfully slowed down by aloe extracts. Additionally, extract rendered worms inert and exterminated them, demonstrating its promise as anthelmintic. Aloe is a rich resource of antibacterial and insecticide active principles, it can be inferred from this.

In vitro larval stages of the *Ascaridia galli* species are inhibited from developing when *Aloe secundifora* crude extracts are used. With lyses of larval stages and the largest inhibition percentages, acetone and crude aqueous extracts exhibited the strongest anthelmintic activity. The extract concentration utilised determines the inhibitory impact. Further anthelmintic assessment requires dose determination and confirmation investigations.

Pradeep kumar dubey *et al*. (2015) [16] reported that Anthelmintic studies on roundworm and earthworm also showed lethal effect of aloin on worms. This effect is comparable to standard piperazine. Zafar Iqbal *et al*. (2012) [17] reported that research on roundworms and earthworms using anthelmintics similarly revealed the fatal effects of aloin on worms. This has a similar impact as regular piperazine.

3. Materials and Methods

The research for this study was done at the research institute and livestock farm unit of the Anbil Dharmalingam Agricultural College in Trichy. Goats are raised in the unit using a sophisticated grazing method. For this study, 60 goats of both sexes with an age range of 1 to 3 years were principally chosen. Thirty of these severely infected gastrointestinal helminths were chosen for the study. Three groups of the 30 goats were formed. (Ten goats/group).

Group A: Albendazole @ 10 mg/kg solution was administered orally.

Group B: *Aloe vera* pulp @ 250 gm/goat was administered orally.

Group C: No drug was administered used as untreated as control group.

3.1 Collection of *Aloe vera*

Mature *Aloe vera* was collected from herbal garden within the campus of Anbil Dharmalingam Agricultural College and Research Institute, Navalur Kuttapattu, Trichy. Whole leaves are chopped, the pulp is freshly collected, and it is then given to patients orally. The *Aloe vera*-treated animals were monitored for 24 hours for any potential toxicity problems, but no abnormal alterations to their physiological characteristics were found.

4. Methodology

4.1 Fecal sample examination

On days 0, 7, 14, and 28 after treatment, goats' rectums were used to collect faeces. Using a completely saturated solution of sodium chloride as the floating medium, the modified Mc Master procedures were used to count faeces, and the following formula was used to calculate EPG:

EPG = Total number of eggs in 2 chambers X 50,

Where, 50 was the dilution factor.

5. Results and Discussions

The present study was conducted to compare the efficacy of synthetic and herbal anthelmintics against the gastrointestinal helminths in free range of rearing goats. The main biological study was carried out on day 0 pre-treatment and on day 7, 14 and 28 post treatment. Fecal egg counts were recorded by Mc Master Technique.

Table 1: Anthelmintic efficacy of herbal and modern anthelmintics against GI helminths in goats

Group	Anthelmintics	Dose mg/kg	Route	Mean EPG Pre-treatment ± SE (0 day)	Post treatment 7th day	14th day	28th day
A	Albendazole	10	oral	400±20.82	50±19.44	0	0
B	*Aloe vera* leaf	250 gm/goat	oral	385±16.44	78±66.88	6±6	0
C	control	-	-	390±30.32	400±36.36	420±35.96	425±25.96

N = 10, means with same superscripts do not differ significantly (p<0.05)

On day 0, there is no significant difference in the pre-treatment. The highest EPG is shown by the three groups. The Mean EPG for Groups A and B indicates a substantial (p<0.005) decline after day 7 post-treatment. No significant decrease is seen in Group C.

On day 14 post treatment the animals of Group B showed significantly low (p<0.005) EPG as compared to that of day 7 post treatment.

No infection was detected in Group A and B at day 28 post treatment, but Group C exhibited an EPG of 425±25.96. During this study it was also observed that there were no significant (p>0.05) changes in EPG of the animals of control group. Albendazole exhibited 100% efficacy on day 14th and 28th post treatment, whereas *Aloe vera* exhibited 100% efficacy on day 28th post treatment.

Albendazole's anthelmintic effectiveness is widely known, but when its effectiveness was compared to *Aloe vera*, it was discovered that the latter's leaves exhibit pronounced anthelmintic properties.

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