SHORT COMMUNICATION

Comparative Efficacy of Closantel and *Azadirachta indica* against Strongyle Infection in Goats

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Abstract

This study was carried out to evaluate the comparative efficacy of closantel and *Azadirachta indica* seed powder against strongyle infection in goats. Infected goats having >500 eggs per gram of faeces were included in the present study and divided into three groups (A, B, and C) of six goats each. Group A animals were treated with closantel @ 10 mg/kg b.wt., Group-B with neem seed powder @ 4 g/kg b.wt, Group C with neem seed powder @ 8 g/kg b.wt. Number of eggs per gram of faeces (EPG) were recorded on day 0 (before treatment), 7, 14, 21 and 28 day (post treatment). On the basis of EPG values, it was observed that closantel had more efficacy than neem seed powder as percent reduction in EPG was higher in closantel treated goats (91.12%) as compared to neem seed powder @ 8 g/kg body weight treated goats (62.49%). The efficacy of neem seed powder @ 4 g/kg b.wt was 38.09%. Thus, it was concluded that higher dose of neem seed powder has effective against strongyle infection in goats.

Keywords: Anthelmintic efficacy, Goats, Neem seed, Strongyle.

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Introduction

Parasitic gastroenteritis caused by strongylosis pose a serious health threat and a limitation to the productivity of goats due to the associated morbidity and mortality (Nwosu *et al*., 2007). The control of these helminths depends upon strategic and tactical use of anthelmintics. Among helminths, nematodes are the most important in terms of prevalence and adverse effects (Gupta *et al*., 2016 a and b). Helminth control in domestic animals is extensively based on anthelmintic drugs (Charles *et al*., 1989); however, at present, efficacy of these drugs has been reduced because of resistant nematode strain (Echevarria *et al*., 1996). In addition to treating flukes, the closantel is effective against nematodes such as *Hemonchus contortus*, *Oesophagostomum* spp., *Bunostomum* spp., and *Ostertagia* spp. in both sheep and goats. Anthelmintic resistance is a common phenomenon and growing concern in the livestock-raising areas of the world. Also, the presence of chemical residues in animal products made it obligatory to look for various alternative solutions (Dongre *et al*., 2015). The use of bioactive forages like neem as a means to control strongyle infection in goats might offer a whole "new" range of anthelmintics in the form of the plant secondary metabolites that provide anthelmintic activity (Hoste *et al*., 2008). The objective of the present study was to evaluate the efficacy of closantel and *Azadirachta indica* against strongyle infection in goats

Materials and Methods

Preparation of Neem Seed Powder

Neem (*A. indica*) seeds were procured from the Veterinary college campus Mhow and nearby localities. The seeds were dried at room temperature, ground to a fine powder, and stored in airtight containers until further use.

Selection and Treatment of Animals

A total of 18 goats of either sex-positive for strongyle infection with >500 egg per gram (EPG) were selected from Mhow and nearby areas and divided into three groups as A, B, and C with six animals in each group. Group-A goats were treated with closantel @ 10 mg/kg body weight. Group-B and C were treated with neem seed powder @ 4 g/kg and 8 g/kg body weight, respectively.

Collection and Examination of Fecal Samples

Freshly passed or rectal fecal samples of goats were collected in an individual polythene bag on day 0 and 7, 14,

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Table 1: Mean (±SE) values of EPG in different groups of goats at different days of treatment

Days	*Groups*		
	A (n = 6)	*B (n = 6)*	*C (n = 6)*
0	$1316.67^{aA} \pm 107.75$	$1400.00^{aA} \pm 73.03$	$1333.33^{aA} \pm 55.78$
7	$0000.00^{B} \pm 000.00$	$1216.67^{bAB} \pm 83.33$	$1016.67^{aB} \pm 47.73$
14	$0033.33^{cB} \pm 021.08$	$1083.33^{aBC} \pm 70.32$	$0750.00^{bC} \pm 67.08$
21	$0083.33^{cB} \pm 030.73$	$0966.67^{aCD} \pm 76.01$	$0633.33^{bCD} \pm 61.46$
28	$0116.67^{cB} \pm 030.73$	$0866.67^{aD} \pm 66.67$	$0500.00^{bD} \pm 85.63$

Means with different lower-case superscripts in rows and upper-case superscripts in columns differ significantly ($p \leq 0.05$)

Table 2: Efficacy of closantel and neem seed powder using FECR (%)

	Groups		
Days	*A (n = 6)*	*B (n = 6)*	*C (n = 6)*
7	100	13.09	23.74
14	97.52	22.62	43.75
21	93.67	30.95	52.50
28	91.12	38.09	62.49

21, and 28 post-treatment. These fecal samples were taken to the laboratory in the icebox at the earliest for further examination. A qualitative examination of fecal samples (floatation and sedimentation methods) was performed as described by Soulsby (1982) to detect strongyle infection. Fecal egg count (FEC) was determined by the modified McMaster technique using the saturated salt solution, and efficacy of anthelmintic drugs were determined

Results and Discussion

The mean EPG of different groups on day 0 (pre-treatment) and 7, 14, 21, and 28 post-treatment are presented in Table 1. The efficacy of drugs was calculated based on means FECR percent. Efficacy of closantel @10 mg/kg body weight and neem seed powder at doses of 4 g/kg and 8 g/kg body weight are presented in Table 2.

There was a significant ($p \leq 0.05$) decrease in EPG on day 7 in Group A and maintained till day 28 post-treatment. In contrast, gradual reduction of EPG was observed in other two groups B and C. Tramboo *et al.* (2017), Dixit *et al*. (2019), and Das *et al.* (2015) reported a significant decrease in EPG (98.80, 95.64, and 100%) in crossbred merino sheep, gastrointestinal nematodes in goats and GI nematode infected goats respectively. After treatment with closantel. Efficacy of Neem seed powder @ 8 g/kg body weight was found better than @ 4 g/kg b.w. Neem seed Powder and also efficacy increased steadily from 7 to 28 days

These results are more or less similar to the previous studies of Yakubu *et al.* (2006), Swarnkar*et al.* (2008), Iqbal *et al*. (2010), and Dongre *et al*. (2015). Anthelmintic efficacy of closantel is well established. When compared with the neem seed powder, it has been shown that the seeds of *A. indica* have marked anthelmintic property though in crude form, it is slow acting (Mahboob *et al*., 2008).

Mechanism of action revealed that Closantel exerts its effect by uncoupling oxidative phosphorylation in the mitochondria of cells resulting in disruption of ATP production. This occurs by inhibiting the activity of succinate dehydrogenase and fumarate reductase involved in ATP production by impairing the parasites' motility. Closantel also disturbs the liquid and ion transport mechanism in the parasite's membranes (Westers *et al*., 2016). Anthelmintic activity of *A. indica* is attributed to one of the bioactive constituent Azadirachtin of the plant. At 1-mg concentration of Azadirachtin, there was a reduction in motility of L_3 larvae of *H. contortus* up to 92.5% at 24 hours suggesting that Azadirachtin was able to reduce the motility at increased concentrations (Radhkrishanan *et al*., 2007). Dongre *et al.* (2015) reported that Azadirachtin interferes with the central nervous system of parasites via inhibition of excitatory cholinergic transmission and partly blocks the Ca channel, resulting in the expulsion of parasites from the body.

Conclusion

The antihelminth closantel @10 mg/kg body weight was highly effective against strongyle infection in goats as compared with neem seed powder @4 g/kg body weight than @8 g/kg body weight. Thus, higher doses of neem seed powder are effective against strongyle infection.

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