

Evaluation of Anthelmintic Activity of Neem Seed Powder in Goats

Kusum Lata, G. Das, N. K. Kumbhakar,
 Rupesh Verma

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Abstract Gastrointestinal parasitism is among the most important animal diseases inflicting heavy production losses in goats. Chemotherapy is a major treatment modality used for the control of helminth infection in livestock. Over the past decades, the development of anthelmintic resistance to various groups of anthelmintics and problem of drug residues in animal products has awakened interest in medicinal plants as an alternative source of anthelmintics. Hence, this study was undertaken to evaluate the anthelmintic efficacy of *Azadirachta indica* seed powder against naturally infected gastrointestinal parasites of goats.

In vivo anthelmintic activity of the herbal formulation based on reduction in fecal egg count in goat showing 20.4% reduction was recorded in goats treated with seed powder of *A. indica* @ 4g/kg b.wt.

Keywords *Azadirachta indica*, Neem seed powder, Gastrointestinal parasites, Anthelmintic activity, Goats.

Introduction

Goat is the poor Men's cow. It is phylogenetically more adapted to unfavorable conditions having ability to efficiently convert low-quality vegetable matter into energy dense fat, muscle and milk. Its demand for food is growing rapidly so rearing small ruminants has become more interesting in recent years. The problem of gastrointestinal parasitism is severe in tropical countries due to highly favorable environmental conditions for helminth transmission [1]. There are several important Trichostrongylid nematode including *Haemonchus contortus*, *Ostertagia* and *Trichostrongylus* sp. which can produce devastating effects on goats.

Variety of plants has been scientifically validated for their anthelmintic properties *in vitro* and *in vivo* [2] and neem (*A. indica*) is one of them. Entitled neem, a tree for solving global problems [3]. Neem leaves and seeds are utilized to treat different infections and diseases. Active principles found in neem are: Nimbin,

K. Lata*

MVSc, Department of Veterinary Parasitology, College of Veterinary Science & AH, South Civil Lines, Jabalpur 482001, MP, India
 e-mail : kusslata555@gmail.com

G. Das

Professor & Head, Department of Veterinary Parasitology, College of Veterinary Science & AH, South Civil Lines, Jabalpur 482001, MP, India
 e-mail: gdas7@yahoo.com

N. K. Kumbhakar

Assistant Professor, Veterinary Polytechnic, Jagdalpur, Chhattisgarh 494001, India
 e-mail: niteshkumbhakar@gmail.com

R. Verma

Teaching Associate, Department of Veterinary Parasitology, College of Veterinary Science & AH, South Civil Lines, Jabalpur 482001, MP, India
 e-mail : vrupesh77@gmail.com

*Correspondence

Nimbidin, Ninbidol, Quercetin, Salannin and Azadirachtin. The use of bioactive forages as a means of nematode control might offer a whole new range of anthelmintics in the form of the plant secondary metabolites that provide anthelmintic activity [4]. Dongre et al. [5] evaluated the efficacy of crude neem (*A. indica*) leaf powder in goats naturally infected with strongyle infections. The present work was designed to study the comparative efficacy of neem seed powder with different dosage.

Materials and Methods

Collection and preparation of neem seed powder

For the proposed work, dried neem (*A. indica*) seed were used and procured from the nearby localities. Seeds were dried at room temperature and grinded to fine powder and stored in airtight containers for further use. A sample of the seed was preserved for the further reference.

Selection and treatment of animals

Twenty-one goats of either sex were selection based on EPG ≥ 500 to study the comparative efficacy of neem seed powder at different doses. The animals were grouped into three groups with seven animals in each group. Group-I and II were treated with aqueous crude powder of neem seed @ 2 g/kg body weight and 4 g/kg body weight single dose orally, respectively. Group-III was kept as untreated control.

Fecal examination

Fecal egg counts were determined by the modified McMaster technique using saturated sodium chloride solution as floating medium and EPG was determined by the following formula : EPG = Total number

of eggs in 2 chambers $\times 50$, where, 50 was the dilution factor. The fecal samples of the animals were collected per rectum and examined for EPG on day 0 (pre-treatment) and day 10 (post-treatment). The fecal count data were analyzed for fecal egg count reduction test (FECRT%) using RESO calculator [6]. Resistance to anthelmintic was considered if (a) the FECRT is $<95\%$ and (b) the lower 95% confidence limit is $<90\%$. If one of two criteria is met, resistance was suspected [7].

Results and Discussion

From this investigation, no significant reductions in post treatment FEC were observed for both of the groups treated with seed powder of *A. indica*. In Group-I, the mean EPG on day 0 was 1500 ± 323 it increased on 10th day to 2000 ± 532 whereas in Group-II, the mean EPG on day 0 was 1442.85 ± 374 and it reduced to 1171.4 ± 448 . There was no reduction of fecal egg count in Group-I whereas 20.4% reduction was recorded in Group-II as shown in Table 1.

Similar to our findings, Iqbal et al. [2] observed crude powder and crude methanolic extracts did not show significant activity ($p > 0.05$) at the lower dose used but were found effective at 3g/kg with a maximum reduction of 29.3% in eggs per gram of feces. The leaves of *A. indica* have been used in folk veterinary medicine as an anthelmintic for ruminants [8] however, Worku et al. [9] and Igarashi et al. [10] could not endorse the traditional claims of anthelmintic activity of *A. indica* leaves in sheep and goats. Hordegen et al. [11] did not observe any anthelmintic action of neem seed extract at 3 mg/kg live weight in sheep artificially infected with *H. contortus* and *T. colubriformis*. Chagas and Vieira [12], observed no anthelmintic effect of neem at a dosage of 30 g of dried leaves per goat/day given for 5 days. On contrary to our findings, Nawaz et al. [13] demonstrated

Table 1. *In vivo* anthelmintic activity of the neem seed powder based on reduction in eggs per gram of faeces (Mean $\pm$ SE) in goat naturally parasitized with gastrointestinal nematodes.

Gr.	Drugs	Mean EPG		FECR %
		9 Day	10 th Day	
I	Crude powder of Neem seed (<i>A. indica</i>) @ 2 g/kg b wt orally single dose	1500 $\pm$ 323	2000 $\pm$ 532	-
II	Crude powder of Neem seed (<i>A. indica</i>) @ 4 g/kg b wt orally single dose	1442.85 $\pm$ 374	1171.4 $\pm$ 448	20.4
III	Control	1814.3 $\pm$ 419	1914.3 $\pm$ 378	-

that water extract prepared from leaves of *A. indica* was 89% effective in reducing FEC in sheep. Possible factor for the difference in result may be due to origin of plant material.

Anthelmintic activity of *A. indica* may be attributed to one of the chemical constituent of the plant, Azadirachtin. At 1000 µg concentration of azadirachtin, there was a reduction in motility of L₃ larvae of *H. contortus* up to 92.5% at 24 h suggesting that Azadirachtin was able to reduce motility at increased concentrations [14]. According to Iqbal et al. [2] Azadirachtin compound has been reported to inhibit glutathione-S-transferase and reduced glutathione and UDP-glucuronyl transferase activity in liver, lung, kidney and brain of rats. Dongre et al. [5] revealed that Azadirachtin interferes with the central nervous system of parasite via inhibition of excitatory cholinergic transmission and partly blocks the calcium channel resulting in expulsion of parasites from host body. Costa et al. [15] suggest two hypotheses justifying the absence of anthelmintic effect due to environmental variation and to treatment duration have been disproven. Studies performed in different parts of the world, resulted in negative anthelmintic activity, which demonstrates that there was no influence of the environment on the results. However, further studies are needed with different extracts of neem seed powder with long duration treatment before discarding for its anthelmintic activity.

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