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# Anthelmintic Efficacy of Butea Frondosa and Albendazole in Gastrointestinal Nematode Infected Goats of District Indore-Madhya Pradesh, India

**S. Tomar[1], A.K. Jayraw[2], J.U. Patil[3], S. Yadav[4]**

[1,2,3,4]College of Veterinary Science and A.H. Mhow, Department of Veterinary Parasitology
M.P. 453 446

**Abstract**

A wide variety of secondary metabolites with intriguing biological functions are produced by plants. The active component of Butea frondosa, palasonin, inhibits the uptake of glucose and depletes the content of glycogen; hence, the mechanism of action of this anthelminthic agent may involve the suppression of energy metabolism. These medications frequently disrupt key parasitic targets, including membrane integrity, microtubules, DNA (intercalation and alkylation), and neural signal transduction. The goal of this study was to determine how well methanolic extracts from Butea frondosa seeds and albendazole worked as anthelmintics against gastrointestinal nematodes. The egg hatch assay (EHA) was used to conduct an in vitro study on several gastrointestinal nematode stages. Using the methods of egg per gram of feces and faecal egg count reduction (FECR) in vivo. Methanolic treatment was given to goats. The extract of *Butea frondosa* @ 150 mg/kg b.w. on day 0, 3 and 7. Eggs per gram of faeces were recorded as 883.30 ± 94.60, 783.30 ± 70.30, 333.30 ± 98.90, 466.70 ± 66.70 and 616.70 ± 87.20 on day 0, 7, 14, 21 and 28, respectively. The findings of the current study indicated that, the highest efficacy (62.26%) was recorded on day 14, whereas reduced efficacy of 47.10 and 30.18% was recorded on day 21 and 24, respectively.

**Keywords**: Anthelmintic resistance, efficacy of benzimidazole and albendazole, FECRT, Egg hatch assay, Indore

## INTRODUCTION

At present, the anthelmintic resistance has become widespread in India and has been reported from almost every state of the country. Considering the widespread development of resistance against chemical anthelmintics, minimum usage of chemical anthelmintics becomes necessary.

In order to minimise the usage of chemical anthelmintics, usage of herbal anthelmintics becomes necessary. Several herbal anthelmintics have been tested against parasitic infections and one of them is *Butea frondosa* which is commonly called as flame tree or palash which is having numerous anthelmintic /anti-parasitic properties

Therefore, the present investigation is designed with following objectives, Assessment of benzimidazole resistance in gastrointestinal nematodes of goats by egg hatch assay. *In vivo* evaluation of anthelmintic efficacy of *Butea frondosa* (palash) in gastrointestinal nematode infected goats.

**Materials and methods**

The study area *i.e.* Indore district is located in state of Madhya Pradesh. The Indore district is located in Western region of Madhya Pradesh, on the Southern edge of the Malwa plateau. Malwa's elevation gives it a mild, pleasant climate; a cool morning wind, the Karaman, and an evening breeze, the Shabe-Malwa, make the summer less harsh.

Experimental design

Eighteen goats having more than 300 eggs per gram of faeces were selected for the study and they were divided into three groups (A, B, and C) comprising six goats in each group, irrespective of age, sex and weight. Two groups (A and B) were selected for the treatment and group C animals were kept as untreated control. Animals of group A were treated with methanolic extract of *Butea frondosa* @ 150 mg/kg b. wt. orally on day 0, 3 and 7. Animals of group B were treated with albendazole @ 7.5 mg/kg b. wt. once orally.

Assessment of efficacy of drugs: Approximately 3-5 g rectal faecal sample was collected in an individually labelled polythene bags for recording EPG values on day 0, 7, 14, 21 and 28 post-treatment. Eggs per gram of faeces was determined by the modified McMaster method (Sloss *et al.*, 1994).

**Plate 1. Per rectal collection of faecal sample**

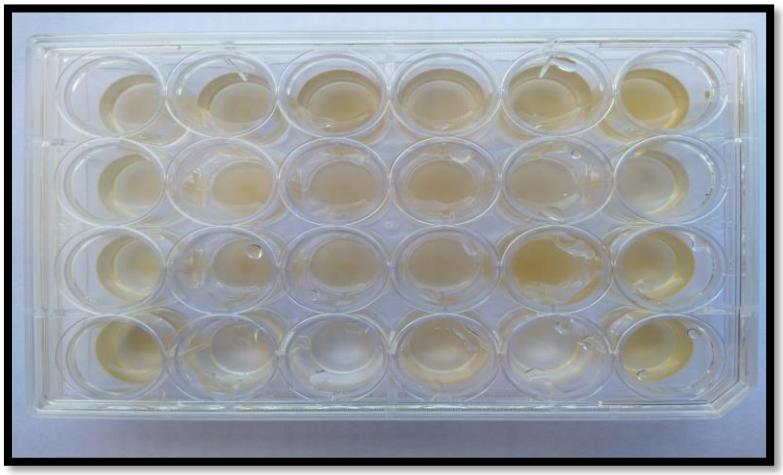

**Plate 2. Cell culture 24 well plate for egg hatch assy (EHA)**

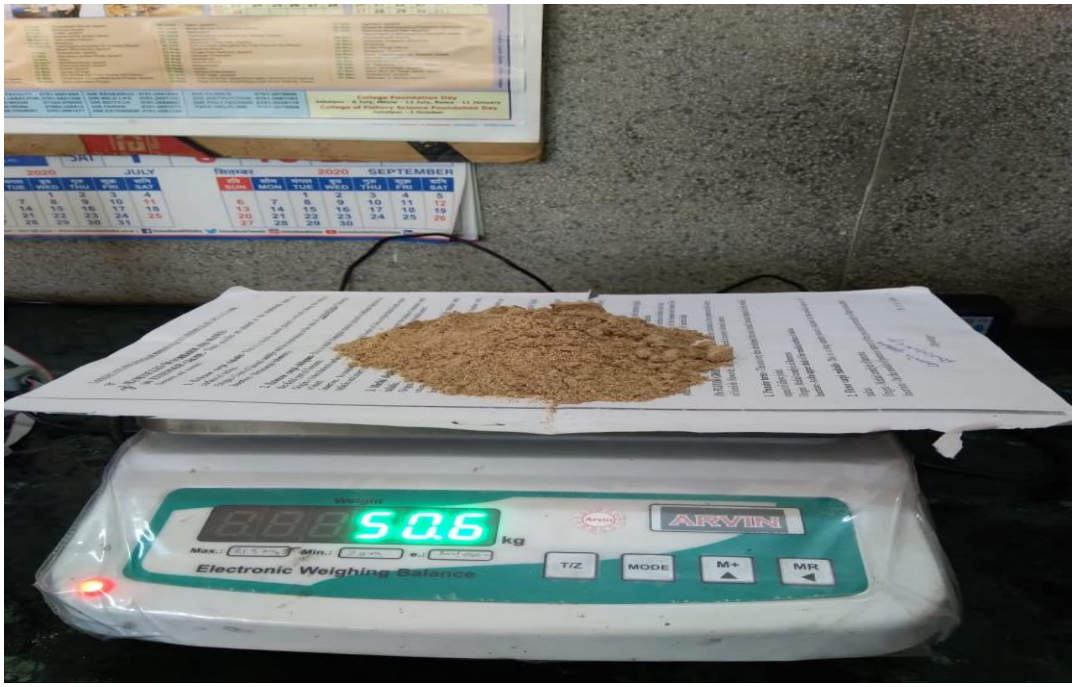


**Plate 3. Grounded powder of palash seeds**

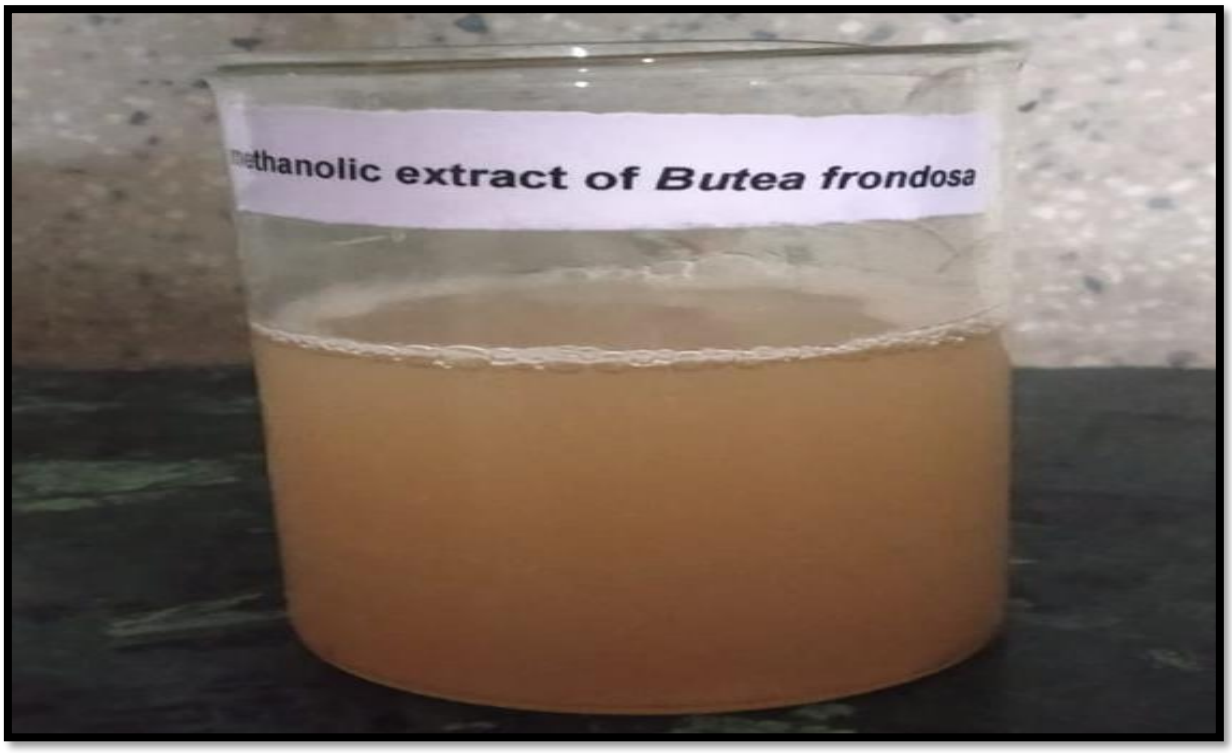


**Plate 4. Methanolic extract of *Butea frondosa***

**Results and Discussion**

In the present experimental settings, efficacy of methanolic extract of *Butea frondosa* was assessed in goats naturally infected with gastrointestinal nematodes. For that purpose, goats were treated with methanolic extract of *Butea frondosa* @ 150 mg/kg b.w. on day 0, 3 and 7. Eggs per gram of faeces were recorded as 883.30 ± 94.60, 783.30 ± 70.30, 333.30 ± 98.90, 466.70 ± 66.70 and 616.70 ± 87.20 on day 0, 7, 14, 21 and 28, respectively. Efficacy of albendazole was also evaluated in the present study for

which, goats were treated with albendazole @ 7.5 mg/kg b.w. once orally and EPG values, 950.00 ± 76.40, 900.00 ± 56.30, 250.00 ± 22.40, 383.30 ± 98.00, 400.00 ± 36.50 were noted on day 0,7,14,21 and 28, respectively (Table 09). The current experiment recorded highest efficacy (73.68%) of albendazole on day 14, whereas reduced efficacy of 59.65 and 57.89% was witnessed on day 21 and 28, respectively (Table 01 and Figure 01).

The findings of the current study indicated that, the highest efficacy (62.26%) was recorded on day 14, whereas reduced efficacy of 47.10 and 30.18% was recorded on day 21 and 24, respectively (Table 02 and Figure 02).

.Moderate efficacy of the compound recorded in the present study is in accordance with the findings of Arora (2006) who recorded 62.50% efficacy in goats, Iqbal *et al.* (2006) recorded efficacy of 78.4% in sheep and Saiyam (2018) who noted 57.14% efficacy of this compound in goats. The moderate efficacy of the compound recorded in the present study could be due to presence of palasonin. Several reports are available on laboratory efficacy of leaves and seed extracts against some roundworms, tapeworms and flukes. The seeds are known to possess anthelmintic activity and their efficacy has been reported against ascarids (Ramanan, 1960), stomach worms of sheep (Garg and Mehta, 1958), *Ascardia galli* (Satyanarayanrao and Krishnaiah, 1982). Raj and Kurup (1967) isolated constituent called as palasonin (lactone from seeds) evaluated experimentally and evinced that palasonin possess a significant anthelmintic property. Effectiveness of palasonin against *Ascaris lumbricoids* and *Fasciola hepatica* was recorded by Rao *et al*. (1977) and Sabir *et al.* (1977). Biochemical mechanism of anthelmintic action of palasonin was investigated on *Ascardia galli* by Kumar *et al.* (1995) and they observed that, palasonin inhibited the glucose uptake and depleted the glycogen content in the presence of glucose indicating that palasonin affects the energy generating mechanism of the parasite. It also significantly increased lactic acid suggesting inhibition of ATP production. Their results indicated that palasonin may act via either inhibition of energy metabolism and/ or alteration in the motor activity of the parasite. As palasonin is inhibiting the glucose uptake of the parasite, hence for continuous inhibition of glucose uptake of the parasite, in the present investigation, methanolic extract of *Butea frondosa* was drenched thrice on day 0, 3 and 7. Swarnakar *et al.* (2008) also noted efficacy of seed extracts of *Butea frondosa* and found that it has significant effect on hatching of eggs of *Haemonchus contortus.*

In the present experimental settings, it was found that, efficacy of the albendazole has been reduced. Similar types of findings were reported by Yadav *et al*. (1993 and 1995), Gill (1996), Ram *et al*. (2007), Godara *et al.* (2011), Ghalsasi *et al.* (2012), Manikkavasagan *et al.* (2013), Rajagopal *et al.* (2013), Dixit *et al.* (2015), Varadharajan and Vijayalakshmi (2015), Singh *et al.* (2016), Shakya *et al.* (2018). As the present experiment was conducted on the organized farm where regular deworming is performed with anthelmintics including the albendazole which happens to be very much popular drug amongst animal owners due to which resistance might have developed against albendazole resulting in reduced efficacy of the drug.

The albendazole being a broad spectrum, short acting anthelmintic which is commonly known as ‘white drench’, hence it is widely used due to its high efficacy, easy availability and affordability. Due to its popularity, it is being widely and indiscriminately used over the years, many a times, the drug is indiscriminately used by farmers for deworming their stock even without proper veterinary advice results in under dosing and owing to prolonged and intensive use along with under dosing might have resulted in development of resistance against this drug. The benzimidazole resistance is correlated with a conserved mutation at amino acid 167 and 200 in β-tubulin isotype 1 (with

Phenylalanine being replaced by Tyrosine) (Kwa *et al*., 1994) and loss of β-tubulin isotype-2 (Roos et al., 1995). Further, the rapid development of resistance in regularly dewormed animals has been proved by Dorny *et al*. (1994) establishing the treatment frequency as the major factor for development of anthelmintic resistance. Under dosing is another factor (Edwards *et al*., 1986) because sub therapeutic doses might allow the survival of heterozygous resistant worms (Smith, 1990). As the bioavailability of benzimidazole and levamisole is much lower in goats than that of sheep, and hence goats need 1.5 to 2 times higher dose than that of sheep (Hennessy, 1994). In the present investigation, dose recommended by the manufacturer (7.5 mg/kg b.w.) was used for deworming the goats, which could be the factor responsible for development of resistance against these drugs in goats of the current study. Furthermore, use of substandard expired and poor quality drugs at field level is also responsible for anthelmintic resistance (Monteiro *et al*., 1998). Pal and Qayyum (1996) opined that frequent and continuous use of a single drug leads to development of the resistance.

**Table 01: EPG values (Mean ± S.E.) in goats treated with methanolic extract of *Butea frondose* and albendazole**

| Day | Groups | | |
|---|---|---|---|
| | **Methanolic extract of *Butea frondosa*** | **Albendazole** | **Control** |
| 0 | $883.30^{a}$±94.60 | $950.00^{a}$±76.40 | $1117.00^{a}$±142.00 |
| 07 | $783.30^{b}$±70.30 | $900.00^{a}$±56.30 | $1033.30^{a}$±88.20 |
| 14 | $333.30^{b}$±98.90 | $250.00^{b}$±22.40 | $900.00^{a}$±57.70 |
| 21 | $466.70^{b}$±66.70 | $383.30^{b}$±98.00 | $866.70^{a}$±49.40 |
| 28 | $616.70^{b}$±87.20 | $400.00^{b}$±36.50 | $916.70^{a}$±94.60 |

Means with same superscripts do not differ significantly (P ≤0.05)

**Table 02: Comparative efficacy of methanolic extract of *Butea frondosa* and albendazole against gastrointestinal nematodes**

| Groups | Treatments | Efficacy (%) | | | |
|---|---|---|---|---|---|
| | | Days | | | |
| | | **07** | **14** | **21** | **28** |
| Group-A | Methanolic extract of *Butea frondosa* | 11.32 | 62.26 | 47.16 | 30.18 |
| Group-B | Albendazole | 05.26 | 73.68 | 59.65 | 57.89 |

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