

ID: 229

## Economic Impact of Ivermectin as Anthelmintic on Body Weight Gain of Goat in Bangladesh

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### Abstract

**Background & Objective:** Goat is an important livestock animal in Bangladesh. To count the efficacy of selective anthelmintic for their treatment effects on body weight gain in Black Bengal goats. A field experiment was conducted at Kotalipara Upazila in Gopalganj district of Bangladesh. **Materials & Methods:** The study was performed during the time from December 2020 to February 2021. The goats were selected randomly for this experiment and divided into two equal groups (treatment group and healthy control group) where each group consisted 30 goats and irrespective to age and sex under same rearing and feeding managements. One injectable Ivermectin (0.2mg/kg body weight, Sub-cutaneous route) preparations (Injection Vermic<sup>®</sup>, Techno Drugs Ltd. Bangladesh) were used for as treatment group. All goats were reared intensively and same feeding status. The efficacy of selected anthelmintic was recorded with measure live body weight from day 0 through day 14 and day 28 of the trial period. **Results:** Overall live weight gain recorded was 0.14 kg in goats of healthy control group whereas 0.76 kg weight recorded in goats of treatment group. The net return obtained by the day 28 of experimental study was Tk. 186 in goats of treatment group as against a profit of Tk. 46 obtained in goats of healthy control group. **Conclusion:** The administration of Ivermectin has a clear beneficial impact on live body weight in goat. More detailed studies are needed to explain the current status of the efficacy of anthelmintics, which are widely used in different agroecologies, animal species and livestock management in Bangladesh.

**Key Words:** Anthelmintic, live weight, efficacy, Kotalipara Upazila, goat

### Introduction

The livestock is an important sub-sector which considered to be backbone of agriculture in Bangladesh (BBS, 2007) and approximately 80% people depend on it directly or indirectly for their subsistence. Among livestock, the population in Bangladesh is currently estimated to comprise 20.75 million goats (DLS, 2020). Black Bengal Goat rearing is very popular in Bangladesh and treated locally as ‘cow of poor people’. Goats play vital role in the substance economy of smallholders in Bangladesh. There are about 38.1 million small ruminants (goats and sheep) in Bangladesh, which play an important role in rural economy and earn substantial amount of foreign currency by exporting skins and other by products (Kamaruddin, 2003). The domestic goat is a sociable, inquisitive, and intelligent species, which has been used for its meat, milk, and fur since, it was first domesticated 10,000 years ago (Genaro *et al.*, 2010). The climatic condition of Bangladesh is favorable to the ecological conditions suitable for parasite of which the helminth parasite predominates. Parasitism has been considered as one of the main constrains of livestock production (Rehman *et al.*, 2009). Helminthiasis especially gastrointestinal nematodiasis overwhelming a severe havoc on health and production (Sahlu *et al.*, 2009), through the world due to impacts on economy also (Silvestre *et al.*, 2000) and market value of the living animals with a high rate of anthelmintic resistance prevalence (Howell *et al.*, 2008). We can prevent and control the parasitic diseases by using a routine prophylactic anthelmintics measurement. The anthelmintic activities and therapy of Ivermectin, Levamisole HCl and albendazole have been studied (Dale and Haylett, 2004). Ivermectin produces flaccid paralysis of parasites by acting as an agonist of the neurotransmitter Gamma Amino Butyric Acid (GABA), thereby disrupting GABA mediated Central Nervous System (CNS) neurosynaptic transmission. The objective of this study was evaluated the impact of the Ivermectin on the weights of goats where there is no-prior diagnosed of infection. There are a number of factors that must be controlled within the study framework, such as differences in exposures, genetics and feeding regime, many of these factors are clustered at the level of herd and the village, hence a randomly controlled trial was used in which treatment with Ivermectin was randomly at the level of individual goat, and within each study herd some animals were randomly as-signed to treatment or to non-treatment.



## Materials and Methods

### Study areas and selection of study animals

The study was carried out at Kotalipara Upazila a small administrative area under Gopalganj district of Bangladesh. Kotalipara is located in Bangladesh at 22.9833 °N, 89.9917 °E. It has 37,603 households and a total area of 362.05 km<sup>2</sup> (Banglapedia, 2022). Sixty (60) Black Bengal goats were selected randomly, irrespective to age and sex under same rearing and feeding managements. Goats were categorized into two groups (healthy control and treatment group) of equal number in different sexes.

### Time and duration of the study

The study was conducted in winter season between December 2020 to February 2021.

### Selection of Anthelmintic

Based on efficacy and pharmacokinetics, Ivermectin was selected and used in this study as anthelmintics.

### Experimental design

#### Body weight measurement

Body weight (Kg) was determined and recorded on day 0 (pre-treatment), 14th and 28th days (post-treatment) with a measuring tape (Anon, 2020) following formula is given below-  
Body weight in Kg = (Heart Girth x Heart Girth x Body Length) / 660

#### Administration of Anthelmintic, Observation and Recording

Goats of treatment group were treated with Vermic<sup>®</sup> injection. Details are given in following table (Table 1).

Table 1. Name, dose and route of administration of Anthelmintic (Ivermectin) used in the study animals.

Sl. No.	Generic name	Trade name	Company name	Dose/kg BW	R/A
01	Ivermectin	Inj. Vermic <sup>®</sup>	Techno Drugs Ltd. Bangladesh	0.2 mg	S/C

All the goats were kept under close supervision and data were recorded and analyzed.

### Data Analysis

The collected data were checked for the integrity, filed and entered into Microsoft Excel spread sheet and analyzed using IBM SPSS (version 25) software. All categorical outcome were expressed in percentage at 95% confidence interval.

### Calculation of Economic impact of Ivermectin anthelmintic in Goats Husbandry

The economic impact was calculated as per following law -

Gross Return (Tk.) = Weight gain x Dressing percentage x Chevon cost

Dressing percentage = 50% of live weight, approximately Chevon cost = 650 Tk./kg.

Net Return = Gross return (Tk.) – [Cost of medication (Tk.) + Gross return of healthy control (Tk.)]

## Results

In this study, it is found that body weight gain in goats of treatment group is much higher than goats of healthy control group.

### Body weight gain in goats of treatment group

In treatment group, body weight gain is much more high and significant (p<0.05) in castrated male goats particularly in male goats than female goats which is shown in (Table 2)

Table 2. Body weight (kg) gain in goats of treatment group

Sex	Pretreatment			Post-treatment			Individual gain (kg)
	0 days (Mean ±SE)	14 days (Mean ±SE)	28 days (Mean ±SE)	0 days (Mean ±SE)	14 days (Mean ±SE)	28 days (Mean ±SE)	
Male (10)	16.42±2.9	16.87±3.00*	17.14±3.01*				0.73±0.12*
Female (10)	16.05±2.69	16.27±2.68*	16.72±2.77*				0.67±0.12*
Castrated male (10)	9.19±1.99	9.52±2.04*	10.07±2.18*				0.88±0.22

\*= Significant at 5 percent level (p<0.05)





### Body weight gain in goats of healthy control group

In control group, body weight gain is also significant ( $p < 0.05$ ) and much more high in castrated male goats particularly in male goats than female goats which is shown in (Table 3).

Table 3. Body weight (kg) gain in healthy control group

Sex	Pre-treatment		Post-treatment		Individual gain (kg) (Mean ±SE)
	0 days (Mean ±SE)	14 days (Mean ±SE)	28 days (Mean ±SE)	28 days (Mean ±SE)	
Male (10)	16.44±3.62	16.57±3.62*	16.56±3.67*		0.11±0.09
Female (10)	11.57±1.43	11.69±1.45	11.68±1.42		0.10±0.02*
Castrated male (10)	10.09±1.68	10.31±1.68*	10.25±1.68*		0.20±0.11

\*= Significant at 5 percent level ( $p < 0.05$ )

### Comparison of body weight gain in goats of both healthy control and treatment group

Comparatively body weight gain in goats of treatment group is significant ( $p < 0.05$ ) and much better than healthy control goats (Table 4).

Table 4. Comparative body weight (kg) gain in goats of both healthy control and treatment group

Total animal	Groups	Pre-treatment		Post-treatment		Individual gain (kg) (Mean±SE)
		0 days (Mean±SE)	14 days (Mean±SE)	28 days (Mean±SE)	28 days (Mean±SE)	
30	Healthy control	12.70±1.45	12.85±1.45*	12.83±1.47*		0.14±0.05*
30	Treatment group	13.88±1.55	14.22±1.58*	14.64±1.61*		0.76±0.09*

\*= Significant at 5 percent level ( $p < 0.05$ )

### Economic impact of using ivermectin as anthelmintic

Economic analysis shown that, the impact of using ivermectin as anthelmintic on body weight gain in treatment group goats is significant, which revealed mean daily weight gain (g) is  $27 \pm 0.07$  and Net return (Taka)  $186 \pm 10$  BDT.

Table 5. Economic impact of Ivermectin in goats on daily weight gain and net return (BDT)

Groups	Mean weight gain (kg)	Mean daily weight gain g/day	Gross return (Taka)	Cost of medication (Taka)	Net return (Taka)
Healthy control	0.14±0.05*	5±0.02	46±3	-	46±3
Treatment	0.76±0.09*	27±0.07	247±8	15±0.5	186±10

\*= Significant at 5 percent level ( $p < 0.05$ )

## Discussion

In this study, the body weight of Black Bengal goats in treatment group increased significantly after use of ivermectin injection than healthy control group (Net return  $186 \pm 10$  Tk. From treatment group a Tk. From healthy control group and  $46 \pm 3$  Tk. in 28 days study period. To maintain good animal husbandry practices, the measurement of live body weight of absolutely essential for breeding, nutrition and health management (Stevens, 2009). Live weight may be estimated through several measurements but the measurement of heart girth and body length seems to be the simplest and most accurate technique.

In this study work reported that  $5 \pm 0.02$  gm/day body weight gain in healthy control group and  $27 \pm 0.07$  gm/day in treatment group. This result are almost similar findings by (Paul *et al.*, 2018) who reported that 26 gm/day weight gain in treatment group treated with anthelmintic.

The maximum individual live weight enhancement of  $0.76 \pm 0.09$  kg was recorded in treatment group and followed by  $0.14 \pm 0.05$  kg enhancement in healthy control group. That are statistically significant. Earlier research work found body weight gain by anthelmintic therapy (Pandit *et al.*, 2009).

The individual mean weight gain from Male  $0.11 \pm 0.09$  kg, female  $0.10 \pm 0.02$  kg and Castrated male  $0.20 \pm 0.11$  kg in healthy control group whereas  $0.73 \pm 0.12$  kg,  $0.67 \pm 0.12$  kg and  $0.88 \pm 0.22$  kg respectively in treatment group. In this study was shown the weight gain is higher in castrated male from both group of goats. This result support the earlier findings by (Chand-Thakuri *et al.*, 1994). The mean daily weight gain was recorded and presented in the descending order as  $27 \pm 0.07$  gm/day in treatment group and  $5 \pm 0.02$  gm/day in healthy control group. This result is almost similar to the earlier finding by (Zajac *et al.*, 1992), although there was different study area and



climate condition. The net return obtained at the end of experimental study was higher (Tk. 186±10) in Ivermectin treated group when compared with healthy control group where gross return was Tk. 46±3.

Our findings are also consistent with the observations of above workers, as a net return of Tk. 186±10 over a period of 28 days. However, the gross return recorded in healthy control group was only Tk. 46±3.

In this present study mean weight gain of 0.76±0.07 kg was recorded in treatment group on 28 days post treatment. The observations of the present study corroborate well with findings of (Sathianesan, 1972), who recorded 1.7 kg weight gain in Tetramisole treated goats after 30 days of observation, this variation of result might be due to climate condition, management practices, anthelmintic choice and breed. Reduced weight gain in gastrointestinal nematode infected goats was also reported by (Howlader, 1997).

We analyzed individual levels of data without accounting for the household effect in this study. Therefore, the findings of the study should be considered carefully. As we conducted a field trial, unknown environmental factors might have influenced the data statistical analysis and thus influenced the results of the study.

More generally, animals need fewer resources to reach maturity, potentially making earing more much economical. Further analysis may consider the effect of anthelmintics on pregnancy and child development as they increase milk production. However, many of these variables should be evaluated in further studies involving measurements to assess the economics of goat production.

### Conclusion

This study indicated that Ivermectin are highly effective to gain body weight in Black Bengal goats. The results of this study may help future researchers explore the detailed pharmacokinetics and toxicity of different types of drugs used for the treatment and control of parasitic diseases in goats in Bangladesh. More studies are needed to explain the efficacy of herbicides commonly used in different animal species and livestock management in Bangladesh. Further research on the pharmacokinetics and toxicity of anthelmintics would be beneficial.

### Funding

The research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

### Acknowledgements

The author is thankful to the Upazilla Livestock Officer of the studied hospital for their cordial support during data collection.

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