

*Original Research***Economic Impact of Gastrointestinal Nematodes on Meat Production from Sheep****Manikkavasagan Ilangopathy¹, Azahahianambi Palavesam², Serma Saravan Pandian Amaresan³ and Raman Muthusamy^{2*}**¹College of Food and Dairy Technology, Tamil Nadu Veterinary and Animal Sciences University, Chennai-600052, INDIA²Translational Research Platform for Veterinary Biologicals (TRPVB), II Floor, Central University Laboratory Building, TANUVAS, Madhavaram Milk Colony, Chennai-600051, INDIA³Department of Animal Husbandry Economics, Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai-600007, INDIA***Corresponding author:** raman.tanuv@gmail.com

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Abstract

The study was undertaken to estimate the economic impact of gastrointestinal parasitic infections in sheep. A total of 117 Madras Red sheep selected in different age groups like >3 years, 2 years and 1 year were used in this study. Egg per gram (EPG) of faeces and body weights of the animals were measured in monthly interval from the year 2012- 2014 at an organised sheep farm, Post graduate research institute of animal sciences (PGRIAS), Tamil Nadu Veterinary and Animal Sciences University, Kattupakkam, Chennai, Tamil Nadu, India. The estimation of economic loss due to gastrointestinal parasitic infections was calculated by accounting the difference in mean body weight gain, dressing percentage of sheep (40%), cost of treatment per sheep and market price (Rs.400/Kg) of meat in Tamil Nadu. The faecal examination results revealed that all the animals were positive for gastrointestinal nematode infection over the period. On coproculture, *Haemonchus contortus* was found to be the predominant species. The regression analysis showed that for every unit of EPG increase there was 0.008 kg loss in weight gain, *ceteris paribus*. The total economic loss was calculated was Rs.1194/ animal in the group of EPG 501-1000 and Rs.1674/ animal in the group of EPG >1000. This study shows that the gastrointestinal nematodes contribute for loss of weight in sheep, its leads to income loss to the farmers. The controlling of GI nematodes and keeping the better deworming practices in sheep is very much essential for increase the farmers income.

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Introduction

In India livestock sector play a vital role in improving the socio-economic conditions of rural masses. There are about 299.99 million bovines, 65.06 million sheep, 135.17 million goats and about 10.29 million pigs as per 19th Livestock Census in India (GOI, 2012). Small ruminants are the backbone of the livelihood of the rural farming community in majority of Indian states. In India goat and sheep contribute 16% and 7%, respectively among the overall meat production. The contribution of the livestock sectors to the national economy in terms of Gross Domestic Product is 4.1% at current prices for livestock sector during 2012 - 2013 (M. M. Islam *et al.*, 2016). Small ruminants suffer from many infectious diseases and heavy economic losses occur due to mortality as well as morbidity. Animal health economics is relatively a new discipline evolved to provide a quantitative insight into the economic impact of diseases in livestock (Dijkhuizen, 1992). Helminthic infections alone are responsible for 5 percent mortality and 10 percent morbidity in sheep (Chakraborty and Lodh, 1994). Gastrointestinal (GI) parasitic infections considered as one of the major constraints in small ruminants' production. Prevalence of GI infection in sheep was one of the major constraints in the small ruminant husbandry in various regions of India (Kuchai *et al.*, 2011; Manikkavasagan *et al.*, 2013 and Singh *et al.*, 2013).

Gastrointestinal nematodes cause severe economic loss in both sheep and goat production, especially the impact of gastrointestinal (GI) nematodes on sheep was very high. Clinical and sub-clinical infection with internal parasites reduces the productivity of small ruminant (Gall, 1981) and gastrointestinal helminth parasites are responsible for significant production losses in grazing ruminants throughout the world. Economic losses due to helminth infections in small ruminants are primarily due to reduced weight gain (Jas *et al.*, 2007) and sub optimal productivity in large ruminants (Kumar, 2006). Since, reports estimating the economic losses due gastrointestinal nematodes in sheep are insufficient, this study was undertaken to determine the economic impact of naturally occurring gastrointestinal nematodes in terms of meat production in sheep in institutional sheep farm located at PGRIAS, Kattupakkam, Tamil Nadu, India.

Material and Methods

Study Area and Animal

The study was conducted from 2012 to 2014 on 117 Madras Red sheep natural infected with gastrointestinal nematodes (GINs) at PGRIAS, Kattupakkam. The sheep were maintained under semi intensive system and deworming was practiced once in three months. The sheep were selected in different age groups like >3 years, 2 years and 1 year and sheep were further categorized based on the faecal egg count such as EPG (<500, 501-1000 and >1000).

Body Weight

The economic loss due to GIN infection in sheep was estimated based on the reduction in body weight gain. The body weight of all the sheep were recorded at monthly interval, with the help of electronic weighing machine.

Faecal Examination

Faecal samples were collected *per rectum* at monthly interval. The eggs per gram (EPG) of faeces were determined by modified Mc-Master technique (MAFF 1989). The faecal samples were pooled and subjected to jar method of faecal culture.

Estimation of Losses

The total economic loss was calculated based on the main components such as differences in body weight, average eggs per gram of faeces (EPG), preventive cost and treatment cost. The cost estimation of mutton calculated based on the dressing percentage is 40% of the body weight for Madras red sheep.

Statistical Analysis

The data were analysed by simple linear regression model and Pearson correlation co-efficient for relationship between body weight and eggs per gram of faeces (EPG) and One-way analysis of Variance (ANOVA) for comparing within groups using SPSS[®] version 20.0 for windows[®]

Results and Discussion

The present study revealed that *H.contortus* as the more predominant species in that farm based on the faecal examination.

Estimation of Economic Loss

The difference in final and initial body weight of individual animals were calculated. The economic loss was calculated based on the Rs.240/kg of meat after deducting the dressing percentage. The result of the weight gain was found to be negatively correlated with EPG and the co-efficient of correlation is -0.441 ($P < 0.001$) (Table1). The co-efficient of linear regression model showed that EPG and weight gain are negatively associated and the causal relationship was found to be statistically negatively associated ($p < 0.001$). Further the value of the regression co-efficient for EPG indicated that for every unit increase in EPG there would be 0.008 kg loss in weight gain, *Ceteris paribus* (Table 2). The value of the adjusted R^2 was found to be 0.87, which indicated that 87.1% variation in weight gain in influenced by the EPG level.

Table 1: Relationship between EPG and weight gain

		EPG	Weight Gain
EPG	Pearson Correlation	1	-0.441**
	Sig. (2-tailed)		0
	N	117	117

**Correlation is significant at the 0.01 level (2-tailed)

Table 2: Causal relationship between EPG and weight gain

Model	Unstandardized Coefficients		T	Sig.	
	B	Std. Error			
1	α (Constant)	8.666 **	0.77	11.258	0
	β (EPG)	-.008 **	0.001	-5.263	0

Jas *et al.*, 2007 conducted the economic loss study in two age group of goat and maintained as anthelmintic treated and infected in each age group and resulting economic loss for the two groups were Rs. 158.09 and Rs. 167.24. The anthelmintic treatment enhances the meat production by controlling the gastrointestinal infection based on the field study in sheep. The mean loss of body weight due to gastrointestinal nematodosis, as recorded, was 3.225 kg with a net per capita loss of 1.613 kg meat production in the infected group during the entire period of the study (12 months) (Jas *et al.*, 2009). In the present study the economic loss was calculated over the period of natural infection of gastrointestinal nematode in Madras red sheep and changes in the body weight gain. Statistical analysis revealed the EPG 501-1000 range of animals were highly infected and the loss was calculated as Rs.1194/ animal and Rs.1674/ animal in the group of EPG-501-1000 and EPG >1000, respectively (Table 3; Table 4) during the entire period of study.

Table 3: The mean weight gains of each EPG group

S. No.	Group	Mean \pm SD
1	EPG<500	7.144 \pm 5.9 ^a
2	EPG 501-1000	2.288 \pm 2.8 ^b
3	EPG>1000	0.8488 \pm 2.6 ^b
F-VALUE		13.06 **

Table 4: Economic loss due to GI parasitism in sheep

Group	Average Loss Due to Reduced Weight Gain	Average Preventive Cost	Average Treatment Cost	Overall Loss
EPG<500	0.000984	14	-	-
EPG-501-1000	1118.05 \pm 299	14	62.37 \pm 10.48	1194.33 \pm 300.64
EPG>1000	1526.48 \pm 385.37	14	153.33 \pm 17.50	1673.81 \pm 423.47

Conclusion

This study has shown an economic loss of Rs.1194/ animal in the group of EPG 501-1000 and Rs.1674/ animal in the group of EPG >1000 over the study period. As well as every unit of EPG increases in animal,

there was 0.008g of weight loss in sheep. So If animal having more EPG which leads to loss of body weight. Thus, this study shows gastrointestinal nematodes mainly affect the animal health as well as loss of farmers' income. To maintain the better deworming practice and control of GI infection in sheep, that will help for better income generation by the farmers.

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References

1. Chakraborty. D and Lodh, C. (1994). Blood biochemical profile in *Fasciola*, *Haemonchus* and *Dictyocaulus* species infection in goat: a comparative study, *Indian Veterinary Journal*, 71: 286-288.
2. Gal, C. (1981). *Goat Production*. Academic Press, London/New York.
3. Jas, R and Ghosh, J. D. (2009). Economic impact of gastrointestinal nematodosis in sheep: Enhanced meat production by anthelmintic treatment, *Indian Journal of Animal Sciences*, 79: 761–763.
4. Jas, R., Datta, S., and Ghosh, J. D. (2007). Economic impact of gastrointestinal nematodosis in goat on meat production, *Journal of Veterinary Parasitology*, 21: 109–12.
5. Kuchai, J., Chishti, A., Manal, M., Zaki, J A., Muzaffar Rasool, Dar, S. A and Hidayatullah Tak. (2011). Prevalence of nematode parasites in Sheep of Ladakh, *India Journal of Agricultural Extension and Rural Development*. 3: 229-231.
6. Kumar, S., Swarnkar, C.P., Singh, D., Kolte Atul, P and Singh, V.K. (2006). Genetic resistance in sheep to parasitic nematodes - A review, *The Indian Journal of Small Ruminants*. 12: 131-145.
7. MAFF., (1986). Ministry of Agriculture, Fisheries and Food Agriculture Development and advisory service manual of veterinary parasitology techniques, (HMSO), London, U.K.
8. Manikkavasagan, I., Bino Sundar, S.T., Raman, M., Susithra, S., Dexilin, M and Abdul Basith, S (2013). Detection of ivermectin resistance in unorganized goat farms of Tamil Nadu. *Indian Veterinary Journal*. 90: 138-139.
9. Singh V., Varshney, P., Dash, S. K and Lal, H P. (2013). Prevalence of gastrointestinal parasites in sheep and goats in and around Mathura, *India, Veterinary World*, 260-262.
10. Dijkhuizen, A.A (1992). Modelling Animal Health Economics. Inaugural speech. Wageningen Agricultural University. Wageningen. p28.
11. Government of India (2012), 19th Livestock census, Ministry of Agriculture Department of Animal Husbandry, Dairying and Fisheries. p11-12.
12. M.M. Islam, Shabana Anjum, R.J. Modi and K.N. Wadhvani. (2016). Scenario of livestock and poultry in India and their contribution to national economy. *International Journal of Science, Environment and Technology*, Vol. 5, No 3, 2016, 956 – 965.