

# TECHNICAL BULLETIN

No. 18, 2021

## Anthelmintic Resistance of Gastrointestinal Nematodes in Small Ruminants

Gastrointestinal (GI) nematode infection is still a major problem in small ruminant farming in Bangladesh. These parasites are responsible for decreased productivity and increased mortality in small ruminants like sheep and goats and cause economic losses to farmers. Despite the adverse effect of GI nematodes on sheep and goat rearing in the country, there has been limited study so far on the epidemiology of nematode infections, and, therefore, it is imperative to investigate GI nematode infection and associated risk factors that make sheep and goats susceptible to the infection.

In the last few decades, the control of parasites mainly relied on anthelmintics, but, unfortunately, frequent use and subclinical dosing have resulted in the development of resistance against anthelmintics. Currently anthelmintic resistance (AR) is widespread and multiple-drug resistant parasites are the greatest concern for small ruminant farming throughout the world. Precise, accurate and timely detection of the development of AR is crucial for the prevention and control of parasites. Investigations on anthelmintic resistance of GI nematodes in sheep and goats are urgently needed. Knowledge of molecular characterization of the most prevalent GI nematode, *Haemonchus contortus*, can provide a foundation for understanding transmission patterns and spread of drug resistance alleles, and eventually help develop an effective control strategy. This project involved investigations on common GI nematodes in terms of epidemiology and AR, and also molecular characterization of the blood feeding GI nematode, *Haemonchus contortus* to determine genetic variability and drug resistance genes and understand parasite transmission patterns.



Laboratory tests with *H. contortus* isolates



**KRISHI GOBESHONA FOUNDATION**

A non-profit foundation for sustainable support to agricultural research and development

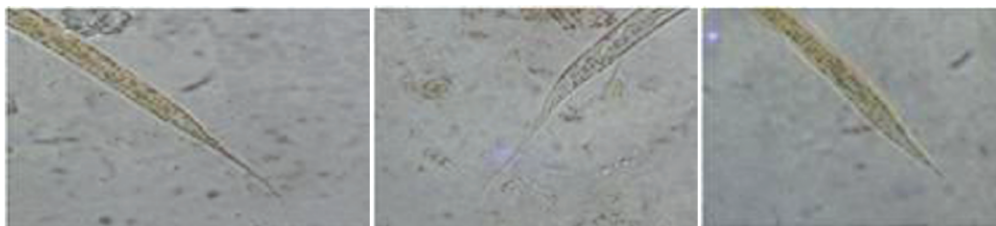
A comprehensive epidemiological study was conducted in seven topographic zones such as, Madhupur (Tangail, Madhupur Tract), Godagari (Rajshahi, Barind Tract), Badarganj (Rangpur, Tista Silt), Mymensingh Sadar (Mymensingh, Brahmaputra Alluvium), Shailkupa (Jhenaidah, Gangetic Alluvium), Char Fasson (Bhola, Coastal Saline Tract) and Rangamati Sadar (Rangamati, Hill Tract). For the detection of resistant nematodes, the guidelines provided by the World Association for the Advancement of Veterinary Parasitology was followed. Allele specific PCR was used to detect anthelmintic resistance at the molecular level. Molecular characterization of important GI nematodes was performed using ITS2 and mitochondrial nicotinamide dehydrogenase subunit 4 (*nad4*) genes as markers to explore genetic variation, understand the parasite transmission patterns and spread of anthelmintic resistance alleles.

## Results and Outputs

- ❖ GI nematodes of small ruminants are highly prevalent in Bangladesh with an overall prevalence in 62% small ruminants *Haemonchus spp.* is the most prevalent parasite in small ruminants throughout the country
- ❖ GI nematode infection was found to occur irrespective of anthelmintic treatment. Poor physical conditions of animals, backyard rearing, muddy housing, poor socio-economic status of the farmers were identified as the risk factors of GI nematode infection in small ruminants.

### *Anthelmintic resistance*

- ❖ Multiple drug resistance was documented in different sheep/goat farms and *Haemonchus spp.*, *Oesophagostomum spp.* and *Trichostrongylus spp.* were detected as the resistant parasites



*Haemonchus spp.*

*Oesophagostomum spp.*

*Trichostrongylus spp.*

### *Identified Resistant larvae in fecal culture*

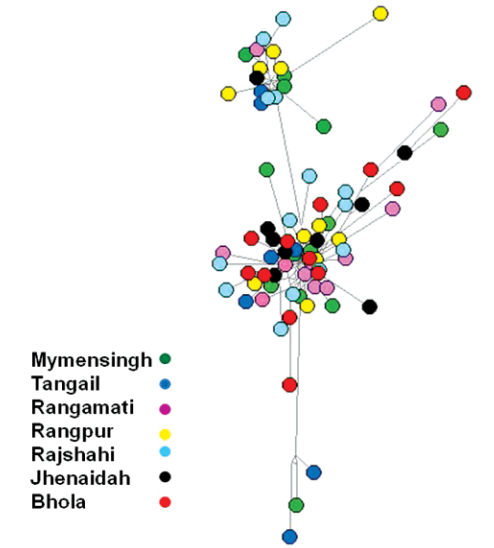
- ❖ Homozygous resistance (*rr*) population of *H. contortus* was found to be emerging and an increased number of heterozygous (*rS*) population was detected.
- ❖ The frequency of resistant allele was more than 25% in different topographic zones of the country.
- ❖ Genetic analysis defined 19 distinct ITS2 genotypes and 77 unique *nad4* haplotypes among the *H. contortus* isolates.
- ❖ Haplotypes tree indicated existence of two populations without marked specification of host and locations among the *H. contortus* isolates in Bangladesh.
- ❖ Very low genetic differentiation but high gene flow was observed within *H. contortus* populations in Bangladesh.

## Benefits and Outcomes

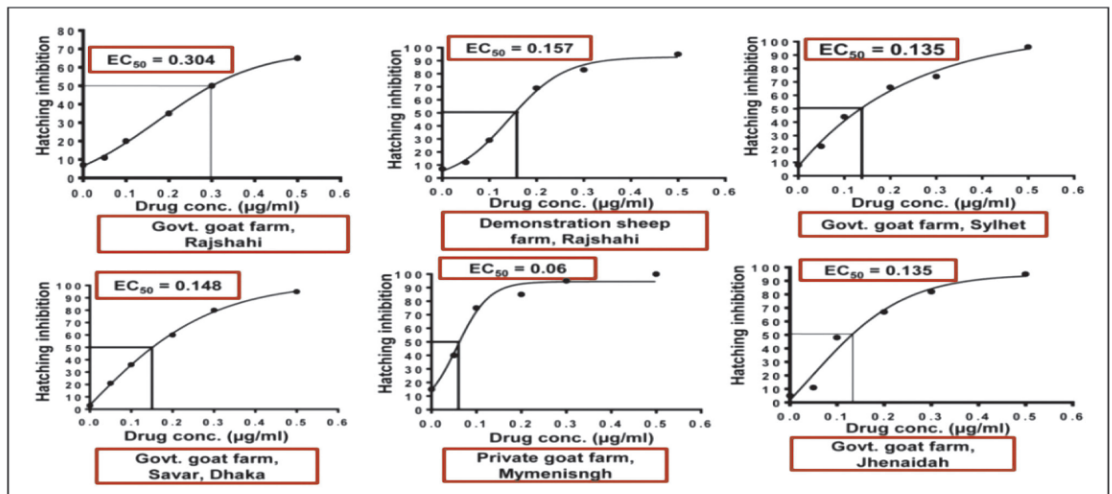
Knowledge on the status of GI nematode and anthelmintic resistance in Bangladesh was generated. Risk factors underlying GI nematode parasite infection in small ruminants of Bangladesh were identified. Multiple anthelmintic resistance was detected in the present study. Proper treatment strategies need to be implemented urgently to minimize the spread of AR. The study yielded new techniques for the detection of AR in Bangladesh. This technology will help AR determination in case of other helminthes, too.

## Recommendations

- Well coordinated, sanitary monitoring of small ruminants by field veterinarians should be initiated;
- Proper treatment strategies need to be implemented urgently to minimize the spread of AR;
- Regular monitoring of parasite populations at the farm level to restrain AR development;
- Detection of BZ resistant allele of *Haemonchus* at the farm level;
- Multi-locus microsatellite typing may be applied for recognition and follow up of epidemiological changes.



Median joining network tree of 77 haplotypes of *H. contortus* isolates of Bangladesh



Anthelmintic resistance of GI nematodes in goats

---

This technical bulletin has been prepared on the basis of technical information available from a completed CGP project of KGF, the details of which are given below:

**Project Code and Title:** TF 18-EM/15. A study on gastrointestinal nematodes and anthelmintic resistance in small ruminants of Bangladesh

**Principal Investigator:** Prof. Dr. Mohammad Zahangir Alam, Department of Parasitology, Faculty of Veterinary Science, BAU, Mymensingh

**Project Duration:** April 2015 to June 2018

---

**Published by:**

**Krishi Gobeshona Foundation**, AIC Building, 3<sup>rd</sup> Floor, BARC Campus, Farmgate, Dhaka-1215, Bangladesh, Telephone: 880-2-9111041, Fax: 880-2-58150270, Website: [www.kgf.org.bd](http://www.kgf.org.bd), E-mail: [kgf-bd@live.com](mailto:kgf-bd@live.com)