

Epidemiological and genetic characterization of larval stages of *Fasciola gigantica* in snail intermediate hosts in Karnataka State, India

Rangappa Rajanna¹, Pamalapati Mahadevareddy Thimmareddy¹, Pinaki Prasad Sengupta^{2*}, Susan Jacob Siju² and Gotakanapura Sanjeevamurthy Mamatha¹

¹Centre for Advanced Faculty Training, Veterinary, College, Hebbal, Bengaluru, Karnataka, India- 560024;

²ICAR- National Institute of Veterinary Epidemiology and Disease Informatics, Yelahanka, Bengaluru, Karnataka, India-560064

Abstract

Fasciolosis in ruminants in India is caused by the liver fluke *Fasciola gigantica*. *Radix (Lymnaea)* spp. are known to carry the infective stages of this parasite. Understanding the seasonal prevalence of *F. gigantica* infection in the intermediate host is of extreme importance in order to elucidate the transmission dynamics of the parasite. So the present study was designed to determine the bioclimatic distribution of larval stages of *F. gigantica* in *Radix* spp. snails as well as to explore the genetic diversity of *F. gigantica* in three geographical regions (Deccan plateau, Western Ghats and coastal region) of Karnataka. The lymnaeid snails were sampled ($n = 2077$) for a period of one year (June 2015 to May 2016) at 24 sites. The snails were morphologically identified and the infection status was established through cercarial shedding and nested polymerase chain reaction (PCR) based technique targeting second internal transcribed spacers (ITS-2) of nuclear ribosomal DNA. The sensitivity of PCR (8.2%) for detection of *F. gigantica* infection within snail is significantly higher than cercarial shedding (4.3%) with an overall prevalence of 5.1%. The prevalence of infection was higher in winter than in the rainy and summer seasons (6.2% instead of 4.6% and 4.3% respectively). Deccan plateau (5.8%) showed a higher prevalence of infection compared to Western Ghats (5.2%) and Coastal region (3.6%). The sequencing ITS-2 region permitted the identification of the parasite as *F. gigantica* which is having high implication in studying the population genetic structure of the parasite in the country. In conclusion, overall results indicated that *Radix* spp. snails harboured *F. gigantica* developmental stages throughout the year and nested PCR was found to be sensitive and specific for detection of *F. gigantica* infection in snails compared to routine parasitological techniques.

Keywords

Fasciola gigantica, snail, genetic characterization, ITS-2

Introduction

Fasciolosis in ruminants, caused by *Fasciola gigantica*, is an economically important disease which incurs an estimated loss of US \$3.2 billion per annum (Spithill *et al.* 1999). Its economic importance is most obvious when the disease causes mortality, but even subclinical infections have shown to cause significant losses from reduced feed conversion efficiency (Mehra *et al.* 1999), weight gains (Hope Cawdery *et al.* 1977), milk yield (Ross 1970; Charlier *et al.* 2007), wool production (Charlier *et al.* 2007), reproductive performance (Oakley *et al.* 1979; Charlier *et al.* 2007), carcass quality (Schweizer *et al.* 2005) and working performance in draught animals and condemnation of liver during meat inspection at slaughter houses

(Vassilev and Jooste 1991). In India, annual milk loss in Uttarakhand due to fasciolosis has been estimated to be of 90.41 crores (Bardhan *et al.* 2014). Despite the recognition of fasciolosis as a threat in India, epidemiological data remains scarce. Even though in India *F. gigantica* is the prevalent species, *F. hepatica* has also been reported from temperate regions of the country. In addition to these two species, there are reports about the existence of hybrid forms of this parasite with the mixed genotype that render it difficult to identify up to the species level by routine morphological examination.

Snails play a crucial role in the transmission of fasciolosis and their regular monitoring is an essential component to determine the transmission dynamics of the parasite in the natural environment which ultimately will help to strategize the control

*Corresponding author: pinakiprasad_s@rediffmail.com