

**STUDIES ON SOME ASPECTS OF NEMATODE INFECTIONS  
IN ANIMALS OF FOOD VALUE WITH AN EVALUATION  
OF PLAUSIBLE FACTORS AFFECTING ZOOONOTIC  
INFECTIONS IN MEGHALAYA**

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I certify that the thesis entitled "**Studies on some aspects of nematode infections in animals of food value with an evaluation of plausible factors affecting zoonotic infections in Meghalaya**" submitted by Sri Arun Kumar Yadav for the degree of Doctor of Philosophy in Zoology of the North-Eastern Hill University, Shillong embodies the record of original investigation carried out by him under my supervision. He has been duly registered and the thesis presented is worthy of being considered for the award of the Ph.D. degree. This work has not been submitted for any degree of any other university.

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## PREFACE

Helminth parasites cause diseases of extreme importance to humans and domestic animals, resulting in great economic losses. This is particularly so in developing countries like India, which is sitting on top of mass of parasites. The need to intensify economic control, of parasites in domestic animals is therefore of prime importance not only from the human health standpoint because of the parasitic zoonoses but from the viewpoint of human nutrition as well, since in the low productivity of livestock and poultry helminth parasites are considered to be among the highly important factors.

Although all pasture animals are parasitized to a greater or lesser degree by various groups of internal parasites such as cestodes, trematodes, and nematodes, etc., the latter, i.e., nematodes pose a more serious threat by emerging as a relatively commonly prevalent group of parasites invading the livestock, particularly in the sub-tropics (Levine, 1980). This is probably because most of the gastrointestinal nematodes have a direct life cycle and do not involve intermediate hosts, which expedites the development and transmission of parasites to these hosts in a very simple manner.

Though extensive studies have been carried out on nematode parasites of domestic animals in different regions of India, there is apparently no work so far done pertaining to helminth parasite infections in livestock animals of Meghalaya, a north-eastern state of India. The state is endowed with a vast potential for animal husbandry. The cattle, goat, sheep, pig, and poultry are the important livestock and pork and beef in particular serve as the main constituent of the diet of local people. Further, it would appear that owing to its altogether

different agro-climatic conditions when compared to other regions of India (i.e., a hilly terrain characterized by a high-rainfall and moderate temperature for major part of the year) the region bears a special significance in context of parasitic infections.

The foregoing account points out the need to recognize the full extent of the parasitic problem in livestock and to have the widest possible knowledge about various species of nematodes that affect these animals in the state. The present work is an initial attempt in this direction and explores some of the basic facts related to worm infections in this region of India.

The focal aspects of the study include:

- (i) a record of the nematode parasite spectrum of animals of food value, namely cattle, goat, sheep, pig and poultry, with a brief description and remarks of each species recovered from the hosts;
- (ii) the surface fine topography with the aid of scanning electron microscope (SEM) of those nematode species for which no information is available so as to elucidate the characters of taxonomic and functional significance;
- (iii) seasonal prevalence of parasitic infections, particularly of the species of major importance in the spectrum, based on actual recovery of worms from, and/or faecal egg counts of, slaughtered animals;
- (iv) an evaluation of plausible factors of zoonotic importance influenced by which parasitic infections prevail, survive, and are transmitted in this region (parasite-host interactions under diverse environmental circumstances may be locally and regionally important epidemiological determinants of hosts' risk to contracting infection);

( iii )

- (v) ascertaining the anthelmintic activity of an indigenous plant, Flemingia vestita (locally known as Soh-phlong), that is regarded and used by natives as an anthelmintic, as evidenced by the effects of the crude extract of the plant tubers on the histomorphology and motility of Ascaris worms in vitro.

**ABBREVIATIONS/SYMBOLS USED IN TABLES**

A	Anterior Portion
DB	Distal Blade Part
M	Middle Portion
P	Posterior Portion
PT	Proximal Tubular Part
R	Right
Y	Posterior Portion of Oesophagus/Oesophageal bulb(B)
§	Distance from Anterior Extremity
*	Distance from Posterior Extremity
**	Distance from Cloaca/Anus
§§	Distance from beginning of intestine

## INTRODUCTION

Helminth parasitic fauna of domestic animals because of its underlying veterinary, medical and consequent economic importance has been studied by various workers and considerable information exists about the common parasites of these animals in different regions of the world (Schillhorn et al., 1975; Balbo et al., 1978; Duarte, 1981; Horak, 1981; Soulsby, 1982; Shaikh et al., 1983).

A look into the literature reveals that of the various helminthic infections prevalent amongst the livestock and poultry, nematodes can be considered to be the most prominent and economically significant group of parasites (Levine, 1980; Soulsby, 1982). In India, the work related to the survey and taxonomy of nematodes of domestic animals was started in the early twentieth century and from time to time the parasite material collected in India found its way into the hands of specialists such as Cobbold in England, Railliet in France, Parona in Italy and Linstow in Germany. Gaiger (1910) published a list of nematode parasites of Indian livestock animals principally based on the material collected from domestic animals of the Punjab and further added some more species to this list (Gaiger, 1915). Later, Lane made a number of studies between the years 1914-1923; Stewart (1914), Sheather (1919) and Sheather and Shilston (1920) also made significant contributions. Since that time fascinating and interesting works mainly in collaboration with Zoological Survey of India (Z.S.I.), Calcutta by such pioneers as Baylis and Daubney

(1922-26) and Maplestone (1929a-39) need mention of. Based on various reports Baylis (1936a, 1939) published a treatise entitled **Fauna of British India, Nematoda Vol. I & II** in which diagnoses of families and genera with a description of nematodes occurring in India and its adjacent countries were provided. According to Baylis, nematodes frequently parasitizing Indian livestock are placed in six orders representing twelve families and several subfamilies. Of these, seventeen genera have been reported to occur in cattle, twelve in goats and sheep, ten in pigs and five in fowl. Subsequently, nearly twenty years later Yamaguti (1961) produced a series of treatise entitled **Systema Helminthum** in which nematodes of vertebrates of the world are included. According to Yamaguti, nematodes of mammalian and avian hosts are described under nine orders and forty-four families and of these seven orders and twenty-five families are represented in Indian domestic animals such as cattle, goat, sheep, pig and fowl.

In a comprehensive taxonomic revision of the nematode group Anderson, Chabaud and Willmott (1974-1982; Anderson and Chabaud, 1983 — CIH Keys) have provided a classificatory scheme which is based on nematodes' inter-relationships in addition to judiciously characteristic features of their morphology. Thus keys to the various taxa within Nematoda prepared by these authors seem to provide a more natural classification which is also indicative of their phylogenetic relationships. As a result many a taxon (genera, subfamilies, etc.) finds in these keys a different place than what was assigned by earlier workers.

It may be mentioned here that studies related to nematodes of livestock and poultry in India mainly include comprehensive surveys of individual host types from various regions of the country. Significant contributions in this regard include those of Gupta and Mathur (1968), Gupta and Sood (1968), Gupta and Acharya (1968, 1970a,b), Sood and Kaur (1975), Gupta and Kalia (1978a,b), Soota and Sarkar (1977,1980,1981a,b) and Baruah et al. (1981), to mention a few. However, from time to time many workers have also reported numerous species of nematodes new to science (Sarwar, 1946a,b; Rammanuchari and Alwar, 1952; Fotedar and Bambroo, 1965; Jain et al., 1965; Ali and Deshpande, 1970).

Our knowledge of this group of parasites is still scanty in respect of north-eastern region of India. The present studies were therefore undertaken to fill this gap which especially aimed at identifying, ordering and registering the various parasitic species of nematodes prevailing in the livestock and poultry of Meghalaya, that represents a sub-tropical and high-rainfall area of India. In the present study during a two-year long exploration of the spectrum of nematode parasites of these hosts, namely, cattle, goat, sheep, pig and fowl, from various localities of the state twenty-four species belonging to thirteen families and eighteen genera were recorded. Of these, while majority of the species are also known to occur in other regions of India, it is for the first time that the occurrence of most of them is being reported from north-east India, Meghalaya in particular; the occurrence of Setaria bernardi, Capillaria-contorta and Strongyloides sp. is recorded herein for the first time from domestic pigs and fowl, respectively in India.

The present work incorporates a description of all these species with remarks and a mention of deviations, if any, from their earlier description.

Representatives of all the species recorded in the present work have been deposited in the Helminthological Collection of the Eastern Regional Station of Zoological Survey of India at Shillong.