

Gastrointestinal Nematode Infections of Goats in a Sub-tropical and Humid Zone of India

ARUN K. YADAV and VEENA TANDON*

Department of Zoology, North-Eastern Hill University, Shillong-793 014, Meghalaya (India)

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ABSTRACT

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Twelve hundred and twenty-eight goats (*Capra hircus* L.) from a sub-tropical and humid zone of India were examined for gastrointestinal nematodes. The species encountered in the region were: *Haemonchus contortus*, *Bunostomum trigonocephalum*, *Oesophagostomum columbianum*, *Trichuris globulosa*, *O. aspersum*, and *T. ovis*. The overall infection rate was 86.8%. Among various species found, *H. contortus* emerged as the most prevalent, although *B. trigonocephalum* and *O. columbianum* were also significantly in evidence.

The seasonal fluctuation in infection was assessed by monitoring the faecal egg count of 1638 goats slaughtered during the 1-year period. The maximum values for the prevalence and overall mean eggs g⁻¹ of faeces (EPG) were observed after the heavy rainfall season and remained at a relatively high level from July to December.

H. contortus and *O. columbianum* appear to be of major importance as parasites in the goats of this climatic zone; the role of climatic factors in their prevalence is discussed.

INTRODUCTION

The climate in a certain locality is one of the factors that determine the type and severity of parasitic infections in grazing animals (Arambulo and Moran, 1981). The nematode infections of goats and sheep have been investigated in different climatic environments of India (Endrejat, 1964; Katiyar et al., 1981; Dubey et al., 1983) and of the world (Assoku, 1981; Grant, 1981; Specht, 1982; Islam, 1984; Rose et al., 1984). However, the spectrum of nematodes parasitizing these animals in a sub-tropical and humid climatic environment, such as that which exists in the northeastern region of India, has not been investigated previously.

The aim of the present investigation was to determine the gastrointestinal

*Author to whom correspondence should be addressed.

nematode parasite spectrum and also to record seasonal fluctuations in these nematode infections, as monitored by faecal egg counts during a 12-month period, in the goats of a selected region in Meghalaya, which represents a sub-tropical and humid zone of India.

MATERIALS AND METHODS

The investigation was carried out between March 1986 and February 1987 on randomly selected goats (*Capra hircus* L.) of the Assam hilly breed, of various ages and both sexes, slaughtered at various abattoirs located in the region. The majority of goats slaughtered at these abattoirs are those reared by natives for meat purposes. However, stock of a mixed geographical origin is occasionally slaughtered when animals are brought from the neighbouring state of Assam to meet increased demand.

Study area

The region under study belongs to the East and West Khasi Hills Districts (with Shillong and Nongstoin as the district headquarters, respectively) of

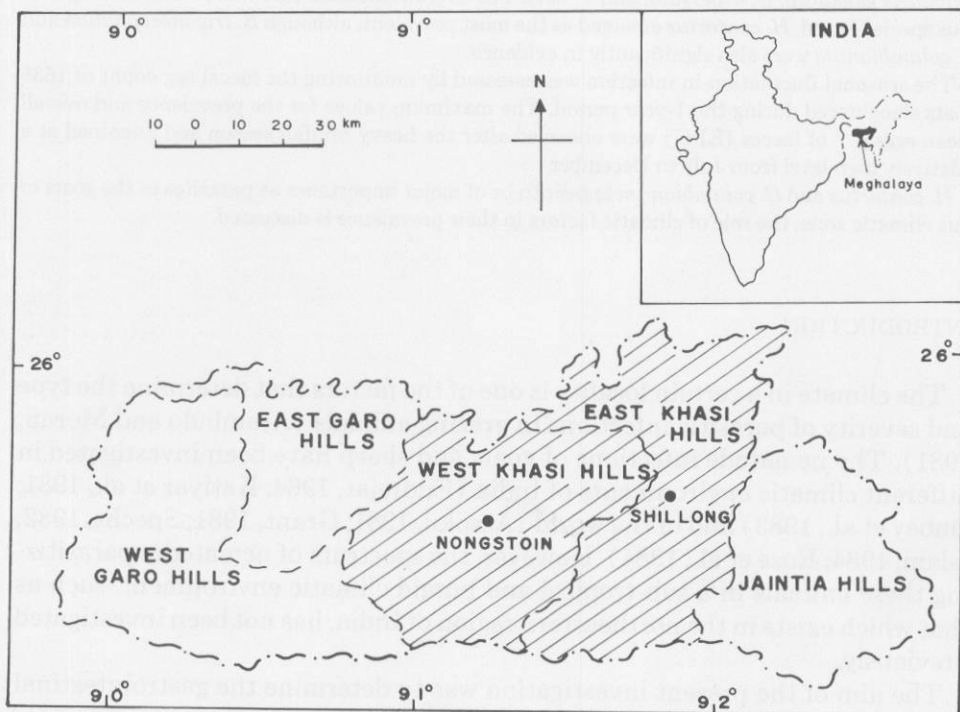


Fig. 1. Study area (shown hatched) in the State of Meghalaya (India).

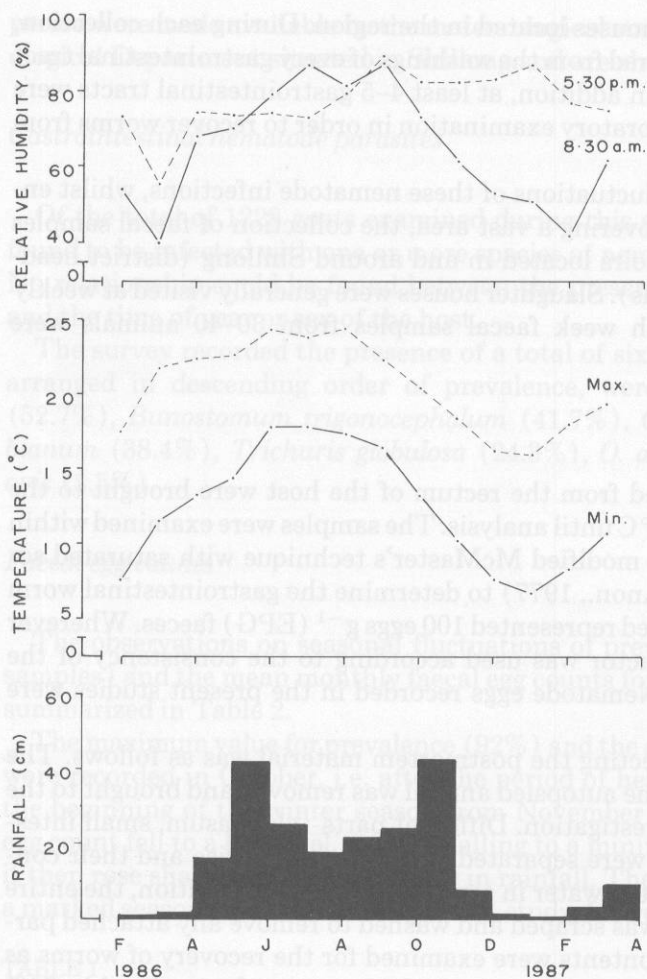


Fig. 2. Average relative humidities at 8.30 a.m. and 5.30 p.m., mean monthly maximum and minimum temperatures, and total rainfall at Shillong during the survey period.

Meghalaya State, which covers a total land area of 10 435 sq. km ($25^{\circ}5' - 26^{\circ}10' N$ and $90^{\circ}45' - 92^{\circ}15' E$) and has an altitude range of 400–1600 m above sea level (Fig. 1). The region has a sub-tropical monsoonic climate. The mean monthly temperatures are moderately high, while the mean daily relative humidity is very high (Fig. 2). The rainfall is excessive and, while distributed throughout most of the year, is greatest between April and mid-October.

Selecting the survey samples

To determine the spectrum of nematode parasites of goats, postmortem recovery of worms was made from goats slaughtered during different times of the

year at various slaughter houses located in the region. During each collection, the specimens were recovered from the washings of every gastrointestinal tract handled by the butchers; in addition, at least 4–5 gastrointestinal tracts were subjected to a detailed laboratory examination in order to recover worms from their sites of predilection.

To study the seasonal fluctuations of these nematode infections, whilst envisaging the problem of covering a vast area, the collection of faecal samples was confined to the abattoirs located in and around Shillong (district headquarters of East Khasi Hills). Slaughter houses were generally visited at weekly intervals and during each week faecal samples from 30–40 animals were collected.

Laboratory procedures

Faecal samples collected from the rectum of the host were brought to the laboratory and stored at 4 °C until analysis. The samples were examined within 48 h of collection using a modified McMaster's technique with saturated sodium chloride solution (Anon., 1977) to determine the gastrointestinal worm egg count; each egg recorded represented 100 eggs g⁻¹ (EPG) faeces. Wherever necessary, a correction factor was used according to the consistency of the faeces (Soulsby, 1982). Nematode eggs recorded in the present studies were exclusively strongylids.

The procedure for collecting the postmortem material was as follows. The gastrointestinal tract of the autopsied animal was removed and brought to the laboratory for further investigation. Different parts (abomasum, small intestine and large intestine) were separated, slit open lengthwise and their contents washed gently with tap water in separate buckets. In addition, the entire gastrointestinal mucosa was scraped and washed to remove any attached parasites. The drained gut contents were examined for the recovery of worms as described by Reinecke (1984). The worms thus recovered were fixed in 70% alcohol and cleared in glycerine–alcohol solution. Identification was made on the sexually mature male worms according to Baylis (1936, 1939) and CIH Keys to the Nematode Parasites of Vertebrates (1974–1983).

Specimen samples of all the species recorded in this survey have been deposited in the helminthological collection of the Eastern Regional Station of the Zoological Survey of India at Shillong.

RESULTS

Meteorological data

The data for total rainfall, mean maximum and minimum monthly temperatures, and average relative humidities for the area pertaining to the survey

period were made available by the meteorological station of the Indian Meteorological Department situated in Shillong and are shown in Fig. 2.

Gastrointestinal nematode parasites

Of the total of 1228 goats examined during this study, 1066 (86.8%) were found to be infected with one or more species of nematode parasite (Table 1). No relationship could be found between the presence of a particular species and the time of year or sex of the host.

The survey recorded the presence of a total of six nematode species which, arranged in descending order of prevalence, were *Haemonchus contortus* (52.7%), *Bunostomum trigonocephalum* (41.7%), *Oesophagostomum columbianum* (38.4%), *Trichuris globulosa* (24.3%), *O. aspersum* (19.6%) and *T. ovis* (3.5%).

Faecal egg counts

The observations on seasonal fluctuations of prevalence (percent positive samples) and the mean monthly faecal egg counts for the 12-month period are summarized in Table 2.

The maximum value for prevalence (92%) and the overall mean EPG (4800) were recorded in October, i.e. after the period of heavy rains was over. With the beginning of the winter season from November onwards, the mean total egg count fell to a low level, steadily falling to a minimum of 150 EPG in May; it then rose sharply with the increase in rainfall. The prevalence did not show a marked seasonal pattern in the present study. However, it was at a minimum

TABLE 1

Gastrointestinal nematodes recovered at necropsy in goats ($n=1228$) from a sub-tropical and humid zone of India

Location/species	No. of animals infected	Percentage of infection
Abomasum		
<i>Haemonchus contortus</i>	647	52.7
Small intestine		
<i>Bunostomum trigonocephalum</i>	512	41.7
Large intestine		
<i>Oesophagostomum columbianum</i>	472	38.4
<i>O. aspersum</i>	241	19.6
<i>Trichuris globulosa</i>	298	24.3
<i>T. ovis</i>	43	3.5

TABLE 2

Monthly EPG of gastrointestinal nematodes in goats from a sub-tropical and humid zone of India

Month and year	Number examined	Percent positive	Mean EPG	Range of mode
March 1986	192	56	200	200-500
April 1986	135	60	400	200-500
May 1986	120	47	150	100-200
June 1986	136	58	550	300-600
July 1986	129	60	1100	700-1000
August 1986	102	52	1800	1600-2000
September 1986	142	60	2500	2100-5000
October 1986	120	91	4800	2000-5000
November 1986	126	88	2600	2000-5000
December 1986	128	80	1000	800-1000
January 1987	130	64	450	200-500
February 1987	178	58	300	200-500

(47%) during May at the onset of the summer season and higher levels were recorded during the late autumn and early winter months.

DISCUSSION

The present study revealed that the spectrum of gastrointestinal nematode parasites of goats in this area comprised only a few species. The survey recorded six nematode species in goats of the region, all of which have commonly been reported in goats and sheep of different climatic areas of the world by several workers (Grant, 1981; Specht, 1982; Chermette, 1983; Rose et al., 1984). However, *Trichostrongylus*, *Ostertagia*, *Cooperia* and *Strongyloides*, which have been reported as commonly occurring in goats from several parts of the world (Assoku, 1981; Grant, 1981; Chermette, 1983; Islam, 1984) and also from other regions of India (Bali, 1976; Dhar et al., 1982), were not encountered in the present study. This is to be expected since these worms occur primarily in temperate regions (Grant, 1981; Soulsby, 1982).

The overall nematode infection rate of goats in the present study was found to be 86.8%, which is more than that reported by Islam (1984) for goats in Zambia (53.8%). The difference might be due to the climatic differences of the two regions. *H. contortus* emerged as the most prevalent species (52.7%) in the region, with *B. trigonocephalum* and *O. columbianum* also being common (41.7 and 38.4%, respectively). These findings are in agreement with those of Grant (1981), Specht (1982) and Vercruysse (1983) who studied the nematode parasites of sheep in a high rainfall area in Zimbabwe, south Mozambique and Senegal, respectively. Our findings are also close to those of Bali and Singh (1977) and Katiyar et al. (1981) who reported *H. contortus* and *B. trigonoce-*

phalum as the most prevalent species in goats of Hissar (Haryana) and sheep of Sikkim, respectively, which represent a sub-humid climate. A relatively short generation interval probably enables *H. contortus* to take rapid advantage of favourable climatic conditions (Grant, 1981), as manifested by its high prevalence in the present study. The warm, moist summer experienced in the region seems to be well suited to the development and survival of the free-living stages of the other two species, namely *B. trigonocephalum* and *O. columbianum*.

A high frequency of overall nematode infections in goats of the area was observed. The rains almost throughout the year result in a high humidity in the environment because of the moderate temperature that prevails in the region. Animal parasites are favoured in such a climate (Williamson and Payne, 1978).

Of the nematode species encountered in the region, *H. contortus* and *O. columbianum* are among those which are serious pathogenic parasites of goats and therefore of considerable ecological importance. Heavy infections (2000–3000 adult worms) of *H. contortus* are very common in the rainy season elsewhere (Vercruysse, 1983). In the case of *O. columbianum*, 200–300 adult worms constitute a severe infection, which is more common in the late wet season (Grant, 1981; Soulsby, 1982). It is likely that the higher egg output of these worms contributes to an increase in the overall mean EPG value from July to November (late wet season). The low mean EPG value observed from January to June might be associated with a self-cure phenomenon (Soulsby, 1982).

The present observations may initially be of help in planning chemotherapeutic and prophylactic strategies for goats from the area studied and also of the regions with similar climatic conditions. As a sequel to the present studies, the ecology of the nematode larval infestations of pastures in the region merits investigation.

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REFERENCES

- Anonymous, 1977. Manual of Veterinary Parasitological Techniques. Tech. Bull. No. 18, H.M.S.O., London, pp. 1–57.
- Arambulo, P.V., III and Moran, N., 1981. The tropics and parasitic diseases of animals—their impact on animal and human health. *Int. J. Zoonoses*, 8: 5–19.

- Assoku, R.K.G., 1981. Studies of parasitic helminths of sheep and goats in Ghana. *Bull. Anim. Health Prod. Afr.*, 29: 1-10.
- Bali, H.S., 1976. A survey of helminth parasites of sheep (*Ovis aries*) in Jammu & Kashmir. *J. Anim. Health Prod.*, 4: 25-32.
- Bali, M.K. and Singh, R.P., 1977. Studies on the prevalence of *Haemonchus contortus* in sheep and goats in Hissar. *Haryana Agric. Univ. J. Res.*, 7: 143-148.
- Baylis, H.A., 1936. The Fauna of British India Including Ceylon and Burma. Nematoda. Vol. I. (Ascaroidea and Strongyloidea). Originally published by Taylor and Francis, London, also published by Today and Tomorrow's Printers and Publishers, New Delhi, 408 pp.
- Baylis, H.A., 1939. The Fauna of British India including Ceylon and Burma. Nematoda. Vol. II. (Filarioidea, Dioctophymoidea and Trichinelloidea). Originally published by Taylor and Francis, London, also published by Today and Tomorrow's Printers and Publishers, New Delhi, 274 pp.
- Chermette, R., 1983. Helminths of sheep and their pathogenicity. *Maghreb Vet.*, 1: 21-31.
- CIH Keys to the Nematode Parasites of Vertebrates. Nos. 1-10. 1974-1983. Commonwealth Agricultural Bureaux, Farnham Royal, Bucks., Gt. Britain.
- Dhar, D.N., Sharma, R.L. and Bansal, G.C., 1982. Gastro-intestinal nematodes in sheep in Kashmir. *Vet. Parasitol.*, 11: 271-277.
- Dubey, S.C., Uppal, P.K., Sahni, M.S. and Mathur, P.B., 1983. Epidemiological studies of parasitic gastro-enteritis in sheep under semi-arid areas of Rajasthan. *Indian Vet. J.*, 7: 111-114.
- Endrejat, E., 1964. Helminths and helminthic diseases in Assam. *Indian Vet. J.*, 41: 538-542.
- Grant, J.L., 1981. The epizootiology of nematode parasites of sheep in a high-rainfall area of Zimbabwe. *J.S. Afr. Vet. Assoc.*, 52: 33-37.
- Islam, A.W.M.S., 1984. Helminth parasites of goats in Zambia. *Indian J. Parasitol.*, 8: 57-59.
- Katiyar, R.D., Sinha, A.K. and Sinha, S.B., 1981. A preliminary report on occurrence of parasitic gastro-enteritis in sheep in Sikkim. *Livest. Adviser*, 6: 60-62.
- Reinecke, R.K., 1984. Identification of helminths in ruminants at necropsy. *J. S. Afr. Vet. Assoc.*, 55: 135-143.
- Rose, C.H., Jacobs, D.E., Jørgensen, R.J. and Nansen, P., 1984. Studies on the helminth parasites of sheep in southern Greenland. *Nord. Veterinaarmed.*, 36: 77-87.
- Soulsby, E.J.L., 1982. Helminths, Arthropods and Protozoa of Domesticated Animals. Baillière, Tindall and Cassell, London, 809 pp.
- Specht, E.J.K., 1982. Seasonal incidence of helminths in sheep and goats in South Mozambique. *Vet. Parasitol.*, 11: 317-328.
- Vercruyse, J., 1983. A survey of seasonal changes in nematode faecal egg count levels of sheep and goats in Senegal. *Vet. Parasitol.*, 13: 239-244.
- Williamson, G. and Payne, W.J.A., 1978. An Introduction to Animal Husbandry in the Tropics. Longman, London, 755 pp.