

Seasonal changes in nematode faecal egg counts of sheep in Ethiopia

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SUMMARY

FROM JULY 1985 to June 1986, 651 faecal samples were collected from sheep slaughtered at the Addis Ababa abattoir and analysed to determine the quantity of eggs per gram of faeces (epg) produced by gastrointestinal nematodes in different months. The epg peaked in August 1985 and March 1986, roughly during the two rainy seasons in Ethiopia. Faecal egg counts reflect nematode transmission levels in host populations and the recent level of infective larval population on pastures. The data suggest that strategic treatment of sheep with anthelmintics in June and January is most likely to reduce the shedding of ova at critical periods and minimise transmission levels during the rainy seasons.

INTRODUCTION

sheep population of Ethiopia is estimated to exceed 23 million (FAO, 1986). They are hosts to multiple species of gastrointestinal helminths (FAO, 1968; London University, 1971; Scott et al, 1974; Graber, 1978). These parasites cause diarrhoea, anaemia, reduced weight gains, increased mortality rates and increased production costs (Barger, 1982). There are few reliable estimates of the true economic significance of gastrointestinal helminths in African countries (Akerejola et al, 1979; Bahru Gemechu and Ephraim Mamo, 1979).

principal gastrointestinal nematodes of sheep in Ethiopia have been described by FAO (1968) and Graber (1978). Surveys at the Addis Ababa abattoir from October 1979 to March 1980 found high numbers of infested sheep. *Trichostrongylus colubriformis* (89%), *Trichuris barbetoensis* (83%), *Haemonchus contortus* (67%), *Oesophagostomum columbianum* (53%) and *Bunostomum trigonocephalum* (34%) were the most prevalent species (Bekele Mamo et al, 1982).

control of gastrointestinal nematodes is possible only after surveillance has provided enough information to understand the prevailing epidemiological factors influencing transmission (Armour, 1980; Schwabe, 1980). This paper describes the seasonal pattern of nematode faecal egg counts from mid-1985 to mid-1986 and suggests possible strategic measures for the control of gastrointestinal nematodes of sheep in central Ethiopia.

MATERIALS AND METHODS

Specimens for this study were acquired from sheep slaughtered at the Addis Ababa abattoir from July 1985 to June 1986. Twenty faecal samples were collected weekly from the rectum of slaughtered sheep and kept overnight at 4–8°C. The next morning, the number of nematode eggs per gram of faeces was determined using the McMaster technique with saturated sodium chloride as a flotation solution (Soulsby, 1982).

age, sex and origin of the slaughtered sheep were recorded during sampling. Meteorological data for the study period were obtained from the National Meteorological Services Agency of Ethiopia and from ILCA records. Mean monthly rainfall values were calculated for those areas from which the sheep originated.

RESULTS

Most slaughtered sheep were adult females; only a few males and young animals were seen. The sheep came from the mid northern and central parts of Ethiopia, particularly Wello, Arsi and Shewa administrative regions, which agrees with findings reported by Getachew Asamenew (1977).

Strongyle and trichostrongyle faecal egg counts for each month of the study are given in Table 1. Most sheep were infested. The mean monthly counts peaked in August 1985 (5020 epg) and in March 1986 (2914 epg). Following these peaks, they progressively decreased to 912 epg in December 1985 and to 1416 epg in June 1986. The overall annual mean epg per animal was, 2351. The proportion of infested animals was lowest (78%) when epg rates were lowest (December 1985), and highest (96–100%) when epg rates were highest (July–August 1985).

Table 1. *Strongyle and trichostrongyle faecal egg counts, Addis Ababa abattoir, July 1985–June 1986.*

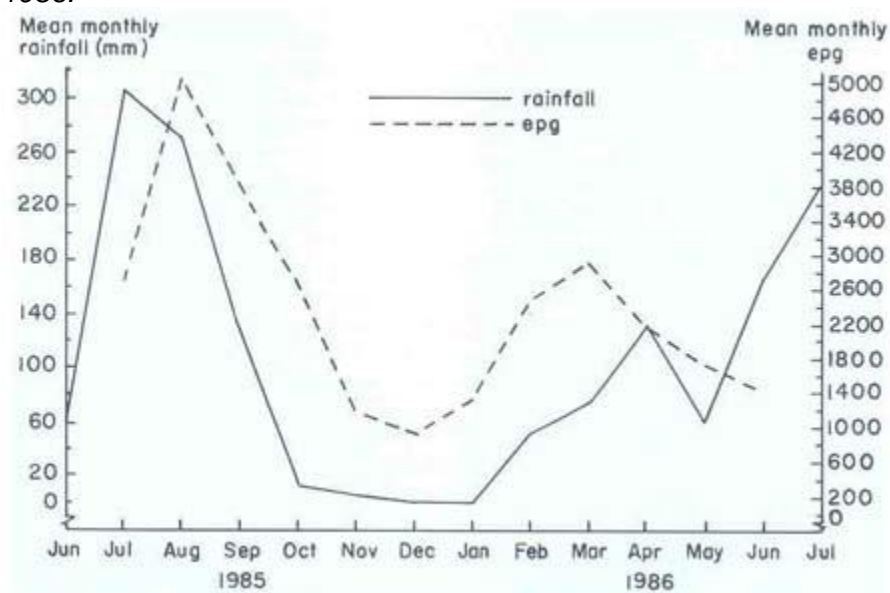
Year/month	No sheep examined	Mean monthly epg	Range (min-max)	No. sheep with positive egg counts	Percentage positive
1985					
July	39	2682.1	200–12 200	39	100.0
August	29	5020.7	0–40 800	28	96.5
September	30	3780.0	0–29 600	28	93.3
October	56	2664.3	0– 7 600	48	85.7
November	59	1169.5	0– 7 000	48	81.3
December	78	912.8	0– 5 000	61	78.2
1986					
January	36	1305.6	0– 6 800	32	88.8
February	43	2469.8	0– 8 800	38	88.3

March	84	2914.3	0–15 000	80	95.2
April	40	2160.0	0–31 400	35	87.5
May	79	1726.6	0–19 800	75	94.9
June	78	1416.7	0– 9 900	69	88.4
Mean	54.3	2351.9		48.4	89.9

The free-living stages of each nematode species require optimum temperature and humidity to develop; however, all thrive better in moist rather than dry environments. In Arsi and Shewa regions, temperature variations ranged from an average minimum of 10.0°C to an average maximum of 21.8°C during July 1985 to June 1986. There was no record available for Wello region.

Ethiopia has two rainy seasons. The long rains extend from July to September and the short rains are usually from March to April. Figure 1 shows the relationship between rainfall and faecal egg output during the period of this study.

Figure 1. Correlation of mean monthly rainfall^a with mean monthly epg counts, June 1985–July 1986.



^a For Arsi, Shewa and Wello administrative regions.

Source: National Meteorological Services Agency (Ethiopia) and ILCA.

DISCUSSION

Different factors influence the egg output of gastrointestinal nematodes. These include the age of the host, the species and age of the nematode population, the overall health of the host (including the nutritional level), and physiological factors such as pregnancy and previous

exposure to parasites. In addition, egg measurements can be affected by the volume and consistency of faeces. Due to these factors, the egg of faeces is not always directly correlated with the number of gastrointestinal nematodes in a host. It is therefore an index of little value for individual animals, but becomes increasingly useful as larger populations are studied.

Roberts and Swan (1981) found a quantitative correlation between worm count and egg on a flock basis in ovine haemonchosis. Barger (1982) used egg as an index to determine the degree of pasture infestation with nematode ova. Vercruysse (1983) used the seasonal changes of nematode faecal egg counts to suggest periods of strategic treatment for sheep in Senegal.

The ova of different nematode genera can be divided into two broad groups, depending on whether or not they can be distinguished from one another. The first group includes strongyles and trichostrongyles, whose ova are similar. The second group comprises those species whose ova can be easily identified—*Ascaris*, *Trichuris*, *Nematodirus* and *Strongyloides*. For the quantitative determination of egg, all eggs were counted except those of *Trichuris* spp. This was done partly because the life cycle and effects of *Trichuris* are different than for most other gastro-intestinal parasites, and partly because the eggs are only partially recoverable with the technique used.

The peaks in the egg counts coincided with the two rainy seasons. The peak during the long rains was higher than the short-rain peak count. The egg associated with the short rains increased as the short rains approached, but peaked before the rainfall, which may be due to the uneven rainfall distribution during this season. The egg after both peaks showed a progressive decline corresponding to the reduction in rainfall. The dry months of November, December and January had the lowest egg counts.

When climatic conditions become favourable, more nematode larval stages develop in the environment and the level of infestation rises. Larvae in a state of arrested development within the host also resume development when external environmental conditions improve (Dunn, 1978; Armour, 1980). Both factors cause the egg to increase. Some helminths, such as *Haemonchus contortus*, which are highly prolific during a short generation interval, can multiply faster and cause heavy pasture infestation (Lapage, 1968; Dunn, 1978). This may account for the rapid increase in egg immediately after the rains start (Vercruysse, 1983).

Ova are shed throughout the year. Lower egg counts during the dry months are due to arrested development and reduced infestation rates. Since adult nematodes are responsible for pasture infestation and renewed transmission of parasites during favourable periods, treatment that reduces this reservoir can greatly reduce the effects of nematode parasites.

Two strategic treatments with broadspectrum anthelmintics, one in June and the other in January, would appear to be most effective. These treatments could reduce the worm burden and minimise pasture infestation with ova. It is only with carefully timed and rational use of anthelmintics that effective control can be expected (Michel et al, 1981). Irregular, frequent or indiscriminate use of anthelmintics can promote the development of resistance (Donald and Waller, 1982).

Although the use of anthelmintics is expensive and not widely applicable in Africa, carefully planned strategic treatment of flocks rather than individual animals can reduce parasite transmission rates and help keep the host–parasite relationship within reasonable bounds. However, it is advisable to remember that although "effective chemotherapy is available for

most helminth diseases, because of their complex epizootiology it is paradoxically simple to treat the individual but almost impossible to control the disease" (Allonby, 1980).

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