Survey of ovine and caprine gastro-intestinal helminthosis in eastern part of Ethiopia during the dry season of the year

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SUMMARY

92 sheep and 91 goats from the arid and semiarid zones of Eastern Ethiopia were used to study the prevalence of gastrointestinal parasites using coproscopy and post-mortem examination during the dry seasons of the year between November 1998 and April 1999. The study unveiled an overall prevalence rate of 95.6% and 100% at post-mortem examination in sheep and goats respectively. Seven different species of nematodes were recovered: Haemonchus spp (90.8% & 96.55%), T. axei (55.8% & 64.3%), T. colubriformis (87.15% & 90%), Bunostomum spp. (38.97% & 35.2%), Strongyloides spp. (38.02% & 43.6%), Oesophagostomum spp. (74.88% & 70.8%), Trichuris spp. (51.75% & 48.2%) and Skrijabinema spp (25.03% & 33.4%) respectively for sheep and goats. Four different types of cestodes belonging to the genera of Moniezia spp., Avitellina spp., Stilesia spp. and a metacestode, Cysticercus tenuicolis were encountered in both hosts. Coproscopy examination in its turn disclosed respectively for sheep and goats: 97.03% & 100% Strongyle eggs, 30.25% & 29.9% Trichuris eggs, 45.22% & 49.3% Strongyloides eggs, 67.68% & 52.5% Eimeria Oocyst and 17.95% & 8.9% Protostrongyle lung-worm. The findings generally suggest the preponderance of polyparasitism in small ruminants of the study area.


RÉSUMÉ

Une étude a été réalisée sur 92 moutons et 91 chèvres provenant de l’Est de l’Ethiopie afin de déterminer la prévalence des parasites gastro-intestinaux. Une prévalence de 95,6% et 100% a été obtenue chez les ovin et les caprin respectivement. A l’autopsie, sept espèces différentes des nématodes ont été recollées : Haemonchus spp (90,8% & 96,55%), T. axei (55,8% & 64,3%), T. colubriformis (87,15% & 90%), Bunostomum spp. (38,97% & 35,2%), Strongyloides spp. (38,02% & 43,6%), Oesophagostomum spp. (74,88% & 70,8%), Trichuris spp. (51,75% & 48,2%) et Skrijabinema spp (25,03% & 33,4%) respectivement chez les ovins et les caprins. En plus, 4 espèces de cestodes ont été récoltées : Moniezia spp., Avitellina spp., Stilesia spp. et un metacestode, Cysticercus tenuicolis. L’examen coproscopie a révélé, respectivement chez les ovins et les caprins : Strongles (97,03% & 100%), Trichuris (30,25% et 29,9%), Strongyloides (45,22% et 49,3%), Eimeria Oocyst et 17,95% & 8,9% Protostrongyle lung-worm. Ces résultats montrent la prépondérance du polyparasitisme chez les moutons et chèvres.


Introduction

In the varied agro-climatic zones of Ethiopia, small ruminants are important source of income for rural communities and are one of the nations major sources of foreign currency from exports. In Ethiopia there are 41 millions of sheep and goats [11] of which 8 millions are slaughtered annually [3] and providing more than 30% of domestic meat consumption [20]. The rich potential from the small ruminant sector is not efficiently exploited; however, due to several constraints, including malnutrition, inefficient management and diseases [28]. This is especially true in many tropical and subtropical regions [21, 22]. Small ruminants under intensive and extensive production systems are extremely susceptible to the effects of wide range of helminth endoparasites. Owing to basic limitations in scope and coverage of most of the studies conducted in Ethiopia, sound helminth control strategy has not yet been established to any of the agro-ecological zones of the country. The present study is, therefore, aimed at determining the prevalence and dynamics of gastrointestinal helminths during the dry seasons of the year in sheep and goats originating from the arid and semiarid zones of Eastern Ethiopia.
Materials and methods

STUDY AREA

The study was conducted on sheep and goats originating from arid and semiarid zones of eastern Ethiopia particularly from Metehara, Afar and Ogaden regions. During September, 1998 to March 1999, Afar and Metehara regions received an average rainfall of 20 mm with a minimum and maximum temperatures of 15.3 °C and 34 °C respectively. Similarly during the same period, Ogaden received 5.3 mm of rainfall with a temperature range of 20-35 °C [25]. 25 % of the national sheep flock and 75 % of the goat population in Ethiopia are found in the low land areas [19].

STUDY POPULATION AND SAMPLE COLLECTION

Weekly regular visits to Debre Zeit export abattoir were made, which allowed collection of 183 gastrointestinal tract (from the abomasum to the rectum), 92 from sheep and 91 from goats, during November 1998 to April 1999. The age of the animals vary from 1-4 years. As soon as possible, after removal of the alimentary tract from the body cavity, the organs were ligated at various anatomical sites and then transported to the Faculty of Veterinary Medicine for examination.

COPROSCOPIC EXAMINATION

From each of the gastrointestinal tract fecal samples were taken directly from the rectum and the level of egg per gram of feces was determined by the standard McMaster egg counting technique using saturated salt solution as a floatation liquid [18, 23].

WORM RECOVERY AND COUNT

Standard procedures [18, 23] were employed to recover worms from the gastrointestinal tract of the study animals. The abomasum was opened along the side of the greater curvature, its contents filtered through the sieve; of 250 µm capable of retaining the larvae; the contents were then washed into a bucket under running water and the total volume was made up to 2 litres. A duplicate of 200ml was transferred to a labelled plastic container and preserved in 10 % formalin. 20 ml of the sub-sample was taken onto a petridish, and 2-3ml of iodine for coloration and 2-3 ml of sodium-thiosulphate were added to facilitate easy identification and examination of worms under stereomicroscope. The number of parasites found in 20ml x 100 gave the total number of parasites found in the abomasum. Small and large intestines were treated like the abomasum for recovery and counting of parasites. The pepsin /HCL method was used to recover the mucosal larvae from the abomasum [18, 23, 31].

STATISTICAL ANALYSIS

Microsoft Excels, a computer software program was used to store database and carry out preliminary statistical analysis. Using Stat-View, statistical soft ware package, the different parameters were tested by employing T test and Analysis of Variance as appropriate.

Results

WORM RECOVERY AND COUNTING

Examination of the 92 gastrointestinal tract of sheep disclosed the presence of seven different genera of nematodes and three genera of cestodes with an overall prevalence rate of 95.6 % and 67.4 % respectively. The different parasites identified were : 90.8 % *Haemonchus* spp., (85.9 % *H. contortus*, 13.5 % *H. placei* and 0.6 % *H. longistipes*), 55.8 % *T. axei*, 87.15 % *T. colubriformis*, 38.97 % *Bunostomum* spp., 51.75 % *Trichuris* spp., 25.03 % *Skrjabinema* spp. 27.65 % *Monezia* spp., 33.77 % *Avitellina* spp., 31.65 % *Stilesia* spp. and a metacestode, *Cysticercus tenuicolis*, 32.85 % (Table I).

An average mean worm burden of 590, 230 & 1241 were counted for *Haemonchus* spp., *T. axei* and *T. colubriformis* respectively during the study period (Table I).

<table>
<thead>
<tr>
<th></th>
<th>November n=19</th>
<th>December n=20</th>
<th>January n=19</th>
<th>February n=16</th>
<th>March n=8</th>
<th>April n=10</th>
<th>Total n=92</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Haemonchus</em></td>
<td>84.2(684)</td>
<td>90(620)</td>
<td>89.5(622)</td>
<td>93.7(726)</td>
<td>87.5(447.5)</td>
<td>100(434)</td>
<td>90.82(590)</td>
</tr>
<tr>
<td><em>T. axei</em></td>
<td>63(270)</td>
<td>65(265)</td>
<td>63.1(221)</td>
<td>43.7(238)</td>
<td>50(200)</td>
<td>50(190)</td>
<td>55.8(230)</td>
</tr>
<tr>
<td><em>T. colubriformis</em></td>
<td>87(1492)</td>
<td>85(1485)</td>
<td>94.7(1010)</td>
<td>93.7(1443)</td>
<td>62.5(1025)</td>
<td>100(990)</td>
<td>87.15(1241)</td>
</tr>
<tr>
<td><em>Bunostomum</em></td>
<td>46(45.6)</td>
<td>45(45)</td>
<td>31.6(32)</td>
<td>43.7(44)</td>
<td>37.5(38)</td>
<td>30(30)</td>
<td>38.97(39)</td>
</tr>
<tr>
<td><em>Strongylodes</em></td>
<td>34(139)</td>
<td>35(134)</td>
<td>31.6(131)</td>
<td>50(175)</td>
<td>37.5(212)</td>
<td>40(200)</td>
<td>38.02(165)</td>
</tr>
<tr>
<td><em>Oesophagostomum</em></td>
<td>57.9(84.2)</td>
<td>80(80)</td>
<td>78.9(79)</td>
<td>87.5(113)</td>
<td>75(75)</td>
<td>70(70)</td>
<td>74.8(83.4)</td>
</tr>
<tr>
<td><em>Trichuris</em></td>
<td>68.4(68.4)</td>
<td>45(45)</td>
<td>31.6(37)</td>
<td>43(44)</td>
<td>62.5(63)</td>
<td>60(60)</td>
<td>51.75(54)</td>
</tr>
<tr>
<td><em>Skrjabinema</em></td>
<td>26.2(29)</td>
<td>22(26.8)</td>
<td>21.2(26.3)</td>
<td>43.7(43)</td>
<td>37.5(38)</td>
<td>0(0)</td>
<td>25.03(27.2)</td>
</tr>
<tr>
<td><em>Monezia</em></td>
<td>36.8</td>
<td>35</td>
<td>31.6</td>
<td>25</td>
<td>37.5</td>
<td>0</td>
<td>27.65</td>
</tr>
<tr>
<td><em>Avitellina</em></td>
<td>42.1</td>
<td>36.8</td>
<td>18.7</td>
<td>37.5</td>
<td>37.5</td>
<td>30</td>
<td>33.77</td>
</tr>
<tr>
<td><em>Stilesia</em></td>
<td>31.6</td>
<td>35</td>
<td>42.1</td>
<td>43.7</td>
<td>37.5</td>
<td>0</td>
<td>31.65</td>
</tr>
<tr>
<td><em>C. tenuicolis</em></td>
<td>21</td>
<td>35</td>
<td>47.4</td>
<td>43.7</td>
<td>50</td>
<td>0</td>
<td>32.85</td>
</tr>
</tbody>
</table>

Table I. — Monthly prevalence and mean worm burden of gastrointestinal helminths in sheep from eastern Ethiopia.
Out of the 91 goats that were examined at post-mortem, seven different genera of nematodes with an overall prevalence rate of 100% were recorded. The different parasites encountered were: 96.5% *Haemonchus spp* (88.8% *H. contortus* and 11.2% *H. placei*), 64.28% *T. axei*, 89.90% *Bunostomum spp.*, 35.20% *Bunostomum spp.*, 43.57% *Stron-gyloides spp.*, 70.80% *Oesophagostomum spp.*, 48.18% *Trichuris spp.* and 33.37% *Skrjabinema spp.* (Table II). An average mean worm burden of 530.2, 213 & 1018 were counted for *Haemonchus spp.*, *T. axei* and *T. colubriformis* respectively during the study period. In addition, 24.2%, 35.13%, 28.80% and 34.0% of the examined goats were found harbouring tapeworms belongs to the genera of Monezia, Avitellina, Stilesia and a *C. tenuicollis* metacestode respectively (Table II). A 54.9% prevalence rate was recorded for all cestode infections.

<table>
<thead>
<tr>
<th>November n=19</th>
<th>December n=19</th>
<th>January n=11</th>
<th>February n=16</th>
<th>March n=16</th>
<th>April n=11</th>
<th>Total n=91</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Haemonchus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 (616)</td>
<td>94.7 (516)</td>
<td>90.9 (536)</td>
<td>100 (688)</td>
<td>93.7 (434)</td>
<td>100 (390)</td>
<td>96.5 (530)</td>
</tr>
<tr>
<td><strong>T. axei</strong></td>
<td>64 (265)</td>
<td>63.1 (263)</td>
<td>63.6 (155)</td>
<td>50 (213)</td>
<td>75 (194)</td>
<td>70 (190)</td>
</tr>
<tr>
<td><strong>T. colubriformis</strong></td>
<td>86 (1224)</td>
<td>84.2 (1210)</td>
<td>81.8 (500)</td>
<td>93.7 (1175)</td>
<td>93.7 (1019)</td>
<td>100 (980)</td>
</tr>
<tr>
<td><strong>Bunostomum</strong></td>
<td>44(43.2)</td>
<td>42.1 (42)</td>
<td>36.4 (36)</td>
<td>43.7 (44)</td>
<td>25 (25)</td>
<td>35.2 (35.1)</td>
</tr>
<tr>
<td><strong>Strongyloides</strong></td>
<td>38(35.3)</td>
<td>37.9 (92)</td>
<td>36.4 (90.9)</td>
<td>50 (156)</td>
<td>50 (206)</td>
<td>43.6 (127)</td>
</tr>
<tr>
<td><strong>Oesophagostomum</strong></td>
<td>57.9 (78.9)</td>
<td>73.7 (74)</td>
<td>54.5 (55)</td>
<td>87.5 (94)</td>
<td>81.2 (81.2)</td>
<td>70 (70)</td>
</tr>
<tr>
<td><strong>Trichurus</strong></td>
<td>63.1 (63.1)</td>
<td>42.1 (42)</td>
<td>36.3 (36)</td>
<td>37.5 (37)</td>
<td>50 (50)</td>
<td>48.18(48.2)</td>
</tr>
<tr>
<td><strong>Skrjabinema</strong></td>
<td>28(34.8)</td>
<td>30 (31.4)</td>
<td>27.3(27)</td>
<td>43.7(44)</td>
<td>31.2(31)</td>
<td>33.37(34)</td>
</tr>
<tr>
<td><strong>Monezia</strong></td>
<td>42.1</td>
<td>31.6</td>
<td>9.1</td>
<td>6.2</td>
<td>6.2</td>
<td>50</td>
</tr>
<tr>
<td><strong>Avitellina</strong></td>
<td>42.1</td>
<td>15.6</td>
<td>45.4</td>
<td>62.5</td>
<td>25</td>
<td>35.13</td>
</tr>
<tr>
<td><strong>Stilesia</strong></td>
<td>26.3</td>
<td>15.8</td>
<td>54.4</td>
<td>37.5</td>
<td>18.7</td>
<td>28.80</td>
</tr>
<tr>
<td><strong>C. tenuicollis</strong></td>
<td>27</td>
<td>26.3</td>
<td>18.2</td>
<td>62.5</td>
<td>50</td>
<td>34.00</td>
</tr>
</tbody>
</table>

**Table II.** — Monthly prevalence and mean worm burden of gastrointestinal helminths in goats from eastern Ethiopia.

**FAECAL EXAMINATION**

From the feces of 92 sheep subjected for coproscopy, 97.8% were found to have eggs of different parasites in the following proportions: 97.03% Strongyle, 30.25% Trichuris, 45.22% Strongyloides, 9.88% cestodes, 67.68% Eimeria Oocyst and 17.95% Protostrongyle lung-worm larvae (Fig. 1). The results of quantitative examination of eggs using modified McMaster method are presented in Table III. Statistical analysis of these results unveiled no significant difference (F = 0.64, P > 0.05) in the amount of EPG between different months of the study period.

An attempt was made to classify the severity of infection based on the level of EPG as proposed by HANSEN J. and PERRY B. [18]. It was found that 75 (83.3%) of the animals were severely infected, 5 (5.5%) were moderately infected and the rest 10 (11.1%) were lightly infected. From the exa-
mined sheep, a maximum of 8 and 5 different parasites were identified from a single animals using post-mortem and coproscopic examination respectively (Fig. 2 & 3).

Out of the 91 goats examined, 100 % were found to have eggs of different parasites in the following proportions : 100 % Stryongyle, 29.9 % Trichuris, 49.3 % Strongyloides, 9.5 % cestodes, 52.48 % Eimeria Oocyst and 8.95 % lungworm larvae (Fig 1).

The EPG results differ significantly (F = 3.59, P < 0.05) between months of the study period. As to the intensity rate, based on the level of EPG, 82(90.1 %), 1(1.1 %) and 8(8.8 %) were classified as sever, moderate and light infections respectively. Comparison of the results of EPG in sheep and goats indicated that there is a significant difference (P < 0.05) between these two species of animals.

Observations on the extent of multiple infestations in goats indicated a maximum of 8 and 4 different parasites from a single animal using post-mortem and coproscopic examination respectively (Fig. 2 & 3).

Discussion

The present study disclosed the existence of a wide variety of GIT helminth parasites, nematode and cestodes, with an over all prevalence rate of 95.6 % and 100 % at post-mortem examination respectively in sheep and goats originating from

![Fig. 1. — Prevalence of the different type of parasite eggs and larvae identified at coproscopic examination.](image1)

![Fig. 2. — Frequency distribution of parasite species recovered at postmortem examination and indications on the status of poly-parasitism.](image2)

![Fig. 3. — Frequency distribution of parasite species recovered at coproscopy and indications on the status of polyparasitism.](image3)
arid and semi-arid regions of Eastern Ethiopia. The over all prevalence rate of gastrointestinal nematodes is very high being maximum for *Haemonchus spp.* (90.82 %, 96.55 %) and a minimum for *Skrjabinema* (25.03 %, 33.37 %) in both sheep and goats respectively (Table I and II). A number of previous studies noted the high prevalence of *Haemonchus spp.* infestation in many parts of Ethiopia: BROOK [7] reported a prevalence rate of 82.1 % in Awassa, SOLOMON [26] 93.6 % in the Ogaden region, DEREGE [8] 80 % in Wollaita Sodo and GETACHEW [14] 92.19 % in Mekelle. It is also in agreement with FAKAE [10] who found a prevalence rate of 77.8 - 100 % in Nigeria and ABEBE [1] who reported a sero-prevalence rate of 70 - 100 % of haemonchosis in small ruminants of West and Central Africa. Considering the voracious blood sucking nature of the *Haemonchus* and in view of finding a mean worm burden of 589 and 530 worms in sheep and goats, respectively, huge quantities of blood would be lost daily, which will undoubtedly have an impact on the health and productivity of these animals. The other important nematodes encountered in the study area are *Trichostrongylus axei* (55.8 % and 64.3 %), *T. colubriformis* (87.15 % & 89.9 %), *Oesophagostomum spp.* (74.88 % & 70.8 %), *Banostomum spp.* (38.97 % & 35.2 %), *Strongyloids sp.* (38.02 % & 43.57 %) and *Trichuris sp.* (51.75 & 48.18 %) respectively in sheep and goats (Table I and II). Most of these parasites except *Strongyloids papillosus* and *Skrjabinema sp.* are widely distributed all over the country as reported by many authors [5, 6, 7, 8, 12, 24, 26, 28, 32].

The present finding with regard to the prevalence of *Strongyloids papillosus* and *Skrjabinema sp.* is the second of its kind following the first report of GRABER [15] in Ethiopian sheep and goats. The pathogenic significance of *Skrjabinema* is said to be very minimal [9, 21] while that of *Strongyloides* is associated with coughing, fever and pneumonia especially during the migratory phase [21].

In the present study four types of cestodes: *Monezia spp.*, *Avitellina centripunctata*, *Stilesia globipunctata* and *Cysticerus tenuicollis* metacestode were recorded with a prevalence rate of 27.65 %, 33.77 %, 31.65 % and 32.85 % in sheep; and 24.20 %, 35.13 %, 28.80 % and 34.0 % in goats respectively (Table I & II). *Monezia spp.*, *A. centripunctata* and *S. globipunctata* were reported by a number of authors BAYOU [5], MELKAMU [24], DEREGE [8], YOSEF [32], GENENE [13] and GETACHEW [14] in different regions of the country. KAUFMANN [21] and SOULSBY [27] mentioned that tapeworms are relatively less pathogenic, but in heavy infections may cause reduced weight gain and intestinal obstruction. The migratory phase of *C. tenuicollis* in case of heavy infection causes traumatic hepatitis and economic losses due to condemnation of the liver [21, 31].

The findings of faecal examination which are indicative of the wide abundance of gastrointestinal helminths in the region, support the previous study of SOLOMON [26] who reported 90 % prevalence rate in the Ogaden region of Ethiopia. Similar surveys made else where in the country also reported high prevalence rate (over 90 %) in small ruminants: 90.94 % in Gonder [12], 92.33 % in Bale [30], 90.23 % in Illubabor [5], 91.0 % in Wollaita Sodo [8] and 91.43 % in Kombolecha [13], all of which indicate the prevailing status of gastrointestinal helminthiosis in small ruminants through out the country.

Among the different parasites identified from the feces of sheep, gastrointestinal strongyles account for 97.03 % prevalence followed by Eimeria Oocyst (67.68 %), Strongyloides (45.52 %) and Cestodes (9.88 %) and similarly in goats 100 %, 52.48 %, 49.30 % and 9.55 % were encountered respectively as shown in fig 1. This finding is in accordance with a number of findings obtained in different parts of the country in which strongyle eggs were dominant. ANENE B.M. [4] reported a high prevalence rate in strongyle infection followed by Eimeria Oocyst and Strongyloid in South Eastern Nigeria.

Analysis of the results of EPG showed that there is a significant difference (P > 0.05) between sheep and goats in the intensity of gastrointestinal nematode infections, which might be attributed to differences in feeding habit of these two species of animals. Whereas a statistical difference (P < 0.05) were seen in the level of EPG among the study months in goats but there was no significant difference in EPG count during the study months in Sheep. These differences might be due to the influence of host variations and differences in husbandry practices within the extensive management systems. However, the majority of both sheep and goats examined were found severely infected and only a small proportion revealed few eggs in their feces. In this study, a good quantity of eggs as determined by the level of EPG were present in the feces of animals in all the study months, irrespective of the species of animals involved creating continuous contamination of the pasture and availability of infective larval stages to animals (table III). In a study conducted at Debre Berhan, North Shoa [2] and at Makelle, Northern Ethiopia [14] no variation of egg counts were noted between the study months in sheep and thus supporting the present finding.

The status of polyparasitism as observed in 183 small ruminants using post-mortem and coproscopy methods indicated that most of these animals harboured 3-5 helminth parasite species at post-mortem (Fig 2), while with a coproscopy examination 2-4 different parasite eggs resided in a single host (Fig. 3). Thus the present study shows a similar picture with the previous study made else where in the country [12, 13, 14, 32] which unveiled the frequent existence of polyparasitism in small ruminants.

From the necropsy and coproscopy examination result it is possible to deduce that there is a continuous infestation throughout the study period and that a number of generations of nematodes and cestodes may be acquired each year. A report by TEKLYE [28] stated that nematode contributes a serious ovine morbidity throughout the year. In conclusion, the high prevalence rate of gastrointestinal helminthiosis documented in sheep and goats in the arid and semi-arid zones of Eastern Ethiopia is found to be very important due not only to its high frequency but also to its considerable pathogenic significance as well as losses it entails to productivity of the small ruminant production sector of agriculture.
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References