REFERENCES


ANNEXURE

SURVEY ON PARASITE CONTROL PRACTICES
IN SMALL RUMINANTS

I. PERSONAL DETAILS OF THE FARMER

1. NAME:

2. ADDRESS:

3. OCCUPATION: AGRICULTURE / LIVESTOCK / OTHER

II. PARTICULARS OF SHEEP/GOAT FLOCK

1. ANIMALS MAINTAINED: Goat / Sheep

2. FLOCK SIZE: 5-10 / 10-20 / 20-30

3. REARING EXPERIENCE: UPTO 5 YRS / 6-10 YRS / > 10 YRS

4. HOUSING: THATCHED / ASBESTOS / OTHER

5. SYSTEM OF MANAGEMENT: SEDENTARY / SEMI-INTENSIVE / MIGRATORY

6. TYPE OF FEEDING: CONC + FODDER / FODDER / GRAZING

III. DEWORMING PRACTICE

1. PERCEPTION OF THE PROBLEM: RAINY / WINTER / SUMMER

2. NO. OF DRENCHES PER YEAR: 1 / 2 / 3 / >3

3. DRENCHING MONTHS: RAINY - JUL / AUG / SEP / OCT
   WINTER – NOV / DEC / JAN / FEB
   SUMMER – MAR / APR / MAY / JUN
4. BASE FOR DRUG SELECTION : NO / OWN EXPERIENCE / ADVICE OF CHEMIST / ADVICE OF VETERINARIAN

5. BASE FOR DOSE CALCULATION : NO / BODY WEIGHT / CHEMIST OR LITERATURE

6. TYPE OF ANTHELMINTIC USED : Only BZ / Only TEM / BZ + TEM / IVM / BZ + TEM + CLS + Others

7. PERCEPTION FOR BEST DRUG : BZ / TEM / IVM / Other

NOTE: Brand names of the drug for the following anthelmintic group:

BZ - Valbazen, Albendos, Albomar, Vetalben, Wormital, Panacur, Curaminth, Fentas, Vetfen, Fasinex, Endex

LEV - Levamisole HCL, Helmonil inj, Nilverm

IVM - Hitek, Mectin, Neomec, Ivomec

Plate 1. Small holder sheep and goat flocks
Plate 2. Collection of nematode eggs from pooled faecal samples

Plate 3. Examination of nematode eggs from faecal samples
Plate 4. Recovery of adult nematodes from the gastrointestinal tract of sheep
Plate 5. Larvae of *Haemonchus* spp.

Plate 6. Larvae of *Oesophagostomum* spp.
Plate 7. Larvae of *Trichostrongylus* spp.

Plate 8. Larvae of *Bunostomum* spp.
Plate 9. Mc Master egg counting slide

Plate 10. 24 well culture plate for EHA and LDA
EMERGENCE OF ANTHELMINTIC RESISTANCE IN NATURALLY INFECTED GOATS OF CUDDALORE DISTRICT, TAMIL NADU

A. Varadharajan* & R. Vijayalakshmi

Division of Animal husbandry, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India.

*Corresponding Author

Abstract

Faecal egg count reduction tests (FECRT) were conducted on goat flocks of all the six taluks of Cuddalore district of Tamil Nadu, India to determine the efficiency of anthelmintics (Fenbendazole, Levamisole and Ivermectin) used for treatment against nematode parasites. The results of the present study revealed high levels of anthelmintic resistance to Fenbendazole treated goats of all over the flocks of Cuddalore district with the reduction of 74 – 91 per cent, whereas, the goat flocks of Chidambaram, Cuddalore and Vridhachalam taluks found to be low resistant to Levamisole with the faecal egg reduction of 91, 91 and 90 per cent respectively. Ivermectin was found to be effective in controlling nematodes in all the farms. The post-treatment (fenbendazole and levamisole) larval culture revealed the presence of *Haemonchus contortus* larvae.

(Key Words: Anthelmintic resistance, goats, Cuddalore)

1. Introduction

Anthelmintic resistance (AR) has developed global issue in the small ruminant industry during past few decades. Most probably, AR is of greater concern in goats than in sheep [1]. Sheep and goats differ in many aspects; as goats have a higher metabolic rate and require higher dose rates for drugs [2-5]. The immune system of goats is also different. The modern broad-spectrum anthelmintics are currently used in prophylaxis and treatment of helminth infections in farm animals [6]. The over usage of anthelmintics ended with the problem of resistance development in the targeted organisms. Anthelmintic resistance is due to traditional treatment, low protein diet and inadequate dose level of anti-parasitic agents [7-10].

In small ruminants, gastrointestinal parasitism is one of the most important cause for production losses around the world. The controlling of G.I parasites can be achieved by various anthelmintics in India despite indiscriminate and frequent usage of anthelmintics exhibits decline in their efficiency and hence resulted in anthelmintic resistance [10-12]. A variety of methods are available to measure anthelmintic resistance including *in vivo* tests such as critical anthelmintic test, controlled anthelmintic test, faecal egg count reduction test and various *in vitro* tests such as egg hatch assay, larval development assay etc [13-16]. The faecal egg count reduction test (FECRT) [17] is recommended by World Association for the Advancement of the Veterinary Parasitology (WAAVP) [18] and is the test of choice especially in the survey for resistance. The status of Fenbendazole, Levamisole and Ivermectin resistances in gastrointestinal nematodes in goat flocks of Cuddalore district, Tamil Nadu, India, has been studied.

2. Materials and Methods

2.1 The study area

The study was conducted in six small holder goat flocks of Chidambaram, Kattumannarkoil, Cuddalore, Panruti, Vridhachalam and Tittakudi taluks of Cuddalore district. One goat flock from each taluk was selected based on good management and having more than 60 animals. Cuddalore district is located between 11°11’ to 12°35’ North latitude and 78°38’ to 80° East Longitude and is predominately an agricultural district. Average elevation of the district is 1 m (3 ft) above Mean Sea Level.

2.2 Experimental design and Anthelmintic treatment

The selected goats were of mixed sex and of 5 to 15 months of age. The age of individual goats was determined from birth register maintained in the farm and also by dentition. Each goat was identified using a numbered ear tag. The selected goats were grouped in to four each group consisting of 15 animals in all the field flocks. One goat flock from each taluk was selected based on good management and having more than 60 animals. Cuddalore district is located between 11°11’ to 12°35’S North latitude and 78°38’ to 80°E East Longitude and is predominately an agricultural district. Average elevation of the district is 1 m (3 ft) above Mean Sea Level.

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2.3 Assessment of efficacy of anthelmintics

Rectal faecal samples were collected on day zero before treatment and then day 10 after treatment. Using gloved finger, about 10 gm of samples were obtained from each goat by digital rectal extraction and then immediately placed in a plastic bag. The bag was tightened as close to the faces as possible to keep off air. Each sample was labelled and transported to the laboratory for further analysis.

2.4 Detection of nematode eggs and estimation of faecal egg counts (FEC)

The simple test tube floatation method was used in the detection of the nematode eggs. Identification of nematode...
percentage egg count reduction of 96

fact that the use of oral ivermectin for deworming has been introduced only recently and its use is not widespread.

Reduction in egg counts of less than 95 per cent with lower 95 per cent confidence limit less than 90 was considered as

Feubendazole treated goats of all the field flocks of the district and some of the flocks also revealed the resistance against nematode parasites. The results of the present study revealed high levels of anthelminitic resistance to gastrointestinal nematodes of field goat farms in certain taluks of Cuddalore district and levamizole were also not effective against GI nematodes of field goat farms in certain taluks of Cuddalore district.

The results indicate the development of resistance against fenbendazole in all the field flocks with lower reduction percentage of 74, 88, 90, 91 and 91 in Chidambaram, Kattumannarkoil, Cuddalore, Panruti, Vridhachalam and Tittakudi taluks respectively. Low resistant to Levamisole found in the fieldflocks of Chidambaram, cuddalore, Vridhachalam and Tittakudi flocks. Resistance to fenbendazole could be attributed to the prolonged and intensive use of the drug over the years. The drug is being widely used by the farmers for deworming their livestock even without proper veterinary advice, often leading to under dosing. In the present study, ivermectin was found effective with a percent egg count reduction of 96 – 99 per cent in all the goat farms of Cuddalore district. This can be attributed to the fact that the use of oral ivermectin for deworming has been introduced only recently and its use is not widespread.

From the above results, it is noted that Fenbendazole at the recommended dosage was not effective against gastrointestinal nematodes at the field goat flocks of Cuddalore district and levamizole were also not effective against GI nematodes of field goat farms in certain taluks of Cuddalore district.

The post-treatment (fenbendazole and levamizole) larval culture revealed the presence of *Haemonchus contortus* larvae.

Reports of anthelmintic resistance are mainly from organized farms with intensive anthelmintic treatment schedules. Existence of drug resistant GI nematodes in breeding animals in farms increases the risk of dissemination of resistant strains to small holder farmers’ flocks as farm bred animals are distributed to farmers [6]. Reports of anthelmintic resistance from small holder farmers’ flocks are rare or uncommon, but if the present use of anthelmintics is continued, the situation can become unmanageable [9]. Thus the detection of anthelmintic resistance in small holder farmers’ flocks is significant and warrants implementation of proper anthelmintic treatment strategies to check further development of resistance [16]. It clearly demonstrated that the goats in the coastal areas of Tamil Nadu have retained resistance to both Fenbendazole and Levamisole as a result of frequent and routine usage. Withdrawing that type of anthelmintic from use and replacing it with an alternate drug along with suitable grazing methods could be the need of this hour.

**Conclusion**

Faecal egg count reduction tests (FECRT) were conducted in goat flocks of all the 6 taluks of Cuddalore district, Tamil Nadu to determine the efficiency of anthelmintics (Fenbendazole, Levamisole and Ivermectin) used for treatment against nematode parasites. The results of the present study revealed high levels of anthelminitic resistance to Fenbendazole treated goats of all the field flocks of the district and some of the flocks also revealed the resistance against Levamizole. Ivermectin was found to be effective in reducing the EPG in all the field flocks. It clearly demonstrated that the goats in the Cuddalore district have retained resistance to both Fenbendazole and Levamisole as a result of frequent and routine usage. Withdrawing that type of anthelmintic from use and replacing it with an alternate drug along with suitable grazing methods could be the need of this hour.

**References**

Annexure

Table 1. Anthelmintics used in the field flocks

<table>
<thead>
<tr>
<th>Animals</th>
<th>Drugs</th>
<th>Company</th>
<th>Dose (mg / kg BW)</th>
<th>Route of Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>Fenbendazole</td>
<td>Intervet India Pvt Ltd</td>
<td>7.5</td>
<td>per os</td>
</tr>
<tr>
<td>Group II</td>
<td>Levamisole</td>
<td>Virbac Animal Health India Pvt Ltd</td>
<td>22.5</td>
<td>per os</td>
</tr>
<tr>
<td>Group III</td>
<td>Ivermectin Oral solution</td>
<td>Virbac Animal Health India Pvt Ltd</td>
<td>2.5 ml / 10 kg BW</td>
<td>Per os</td>
</tr>
<tr>
<td>Group IV</td>
<td>Control</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 2. Mean faecal egg counts and faecal egg count reduction values on pre and post anthelmintic treatments in goat

<table>
<thead>
<tr>
<th>SL No</th>
<th>Smallholder flocks</th>
<th>Anthelmintic</th>
<th>Mean faecal egg count (EPG)</th>
<th>Mean faecal egg count in control group (EPG)</th>
<th>FECR (%)</th>
<th>95% confidence limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>before treatment</td>
<td>after treatment</td>
<td>before treatment</td>
<td>after treatment</td>
</tr>
<tr>
<td>1.</td>
<td>Chidambaram Taluk</td>
<td>FBZ</td>
<td>1540±50.30</td>
<td>406.66±34.20</td>
<td>1786.66 ± 48.30</td>
<td>2133.33±53.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1786.66±96.29</td>
<td>160±22.13</td>
<td>1920±84.03</td>
<td>73.33±15.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IVM</td>
<td>1920±84.03</td>
<td>73.33±15.13</td>
<td>1920±84.03</td>
<td>73.33±15.13</td>
</tr>
<tr>
<td>2.</td>
<td>Kattumannarkoil Taluk</td>
<td>FBZ</td>
<td>1613.33±58.78</td>
<td>186.66±26.47</td>
<td>1680 ± 73.67</td>
<td>2093.33 ± 62.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1666.66±56.84</td>
<td>153.33±30.07</td>
<td>1793.33±80.47</td>
<td>66.66±16.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IVM</td>
<td>1793.33±80.47</td>
<td>66.66±16.49</td>
<td>1793.33±80.47</td>
<td>66.66±16.49</td>
</tr>
<tr>
<td>3.</td>
<td>Cuddalore Taluk</td>
<td>FBZ</td>
<td>1733.33±55.93</td>
<td>166.66±39.98</td>
<td>1680 ± 64.04</td>
<td>2253.33 ± 93.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1660±84.39</td>
<td>166.66±29.73</td>
<td>1953.33±70.61</td>
<td>40±16.90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IVM</td>
<td>1953.33±70.61</td>
<td>40±16.90</td>
<td>1953.33±70.61</td>
<td>40±16.90</td>
</tr>
<tr>
<td>4.</td>
<td>Panruti Taluk</td>
<td>FBZ</td>
<td>1440±84.39</td>
<td>140±31.62</td>
<td>1106.66 ± 46.80</td>
<td>1553.33 ± 58.78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1680±72.98</td>
<td>46.66±17.10</td>
<td>1333.33±69.74</td>
<td>40±13.55</td>
</tr>
<tr>
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<td>IVM</td>
<td>1333.33±69.74</td>
<td>40±13.55</td>
<td>1333.33±69.74</td>
<td>40±13.55</td>
</tr>
<tr>
<td>5.</td>
<td>Vridhachalam Taluk</td>
<td>FBZ</td>
<td>1220±51.70</td>
<td>106.66±18.80</td>
<td>1113.33±52.35</td>
<td>1593.33 ± 61.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1320±54.58</td>
<td>66.66±13.04</td>
<td>1146.66±49.34</td>
<td>73.33±15.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IVM</td>
<td>1146.66±49.34</td>
<td>73.33±15.86</td>
<td>1146.66±49.34</td>
<td>73.33±15.86</td>
</tr>
<tr>
<td>6.</td>
<td>Tittakudi Taluk</td>
<td>FBZ</td>
<td>1253.33±63.78</td>
<td>106.66±21.34</td>
<td>973.33±52.94</td>
<td>1513 ± 50.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEV</td>
<td>1160±54.21</td>
<td>60±13.55</td>
<td>1273.33±79.19</td>
<td>53.33±13.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IVM</td>
<td>1273.33±79.19</td>
<td>53.33±13.80</td>
<td>1273.33±79.19</td>
<td>53.33±13.80</td>
</tr>
</tbody>
</table>
Prevalence and seasonal occurrence of gastrointestinal parasites in small ruminants of coastal areas of Tamil Nadu.

A. Varadharajan and R. Vijayalakshmi

Division of Animal Husbandry, Faculty of Agriculture, Annamalai University, Annamalai Nagar – 608 002. Tamil Nadu, India.

Abstract- The study was carried out from October 2013 to September 2014 in both organised and small sheep and goat farms of coastal areas viz. Cuddalore, Nagapattinam of Tamil Nadu, India. The objective of the present study is to determine the prevalence and seasonal variation of gastrointestinal parasites in small ruminants. A total of 1356 faecal samples (63 from goat and 50 from sheep per month) were collected and subjected for analysis. Among the analysed samples 61.50% were positive for endoparasites. The prevalence of gastrointestinal parasites was higher in sheep (66.33%) than in goats (57.67%). The endoparasites found in small ruminants were nematodes, cestodes and trematodes. The nematode Haemonchus sp was found to be predominant in both sheep and goat. The results of season wise analysis indicates that the overall infection percentage was higher in rainy season (68.36%) followed by winter (60.84%) than in summer (55.30%).

Index Terms- prevalence, seasonal variation, gastrointestinal parasites, small ruminants, Tamil Nadu

I. INTRODUCTION

Small ruminants are widely distributed and are of great importance as a major source of income for small and the landless farmers in rural areas. Sheep & goat with large genetic diversity accounts for about 0.5 to 5% of total output of livestock sector in India [1]. Helminthiasis, especially parasitic gastroenteritis, pose a serious health threat and a limitation to the productivity of small ruminants due to the associated morbidity, mortality, cost of treatment and control measures [2]. In addition to these threats, infestation with helminthes lowers the animal’s immunity and renders it more susceptible to other pathogenic infections; finally this may result in heavy economic losses [3]. The problem is however much more severe in tropical countries due to very favourable environmental conditions for helminth transmission [4].

Three classes of helminthes are distinguished, namely nematodes (roundworms), cestodes (tapeworms) and trematodes (flukes). Several authors [5-11] have explored various aspects of helminth infestation in small ruminants at different localities of Tamil Nadu and other states of India with a range of 25 - 92%. No report is available on prevalence of gastrointestinal helminths in south coastal region of Tamil Nadu viz., Cuddalore and Nagapattinam districts where goat farming is the primordial occupation of the small farmers. Hence, the present study was undertaken to analyse the helminth infestation in small ruminants with appropriate design and effective control measures.

II. MATERIALS AND METHODS

2.1 Study Population

The sheep and goats maintained along the coastal areas of Tamil Nadu viz. Cuddalore and Nagapattinam districts by the organized farms, small and marginal farmers were selected for the study. Four flocks of goat, five flocks of sheep, each flock with 15 – 20 animals, 45 goats reared under semi-intensive system and goats maintained at division of Animal Husbandry, Faculty of Agriculture, Annamalai University were selected for the study. Depending on the climatic condition the animals were allowed for grazing of 5-8 hrs per day.

2.2 Collection and examination of Faecal Sample

From October 2013 to September 2014, a total of 1356 fresh faecal samples were collected from the selected sheep and goat flocks. The faecal samples were examined for helminth eggs using Direct, Sedimentation, Floatation techniques [12, 13].

III. RESULTS AND DISCUSSION

The analysis of faecal samples revealed that among the 1356 samples examined, 834 were found positive for helminth infection with an overall prevalence of 61.5 percent (Table. 1 and Figure. 1). The flock wise analysis of helminth infection was given in Fig. 1 which showed sheep flock was most affected than the goat flock. The results of species wise analysis of faecal samples are shown in Table. 2 and Figure.2. From the table it was noted that both sheep and goat flocks were affected by nematodes (Haemonchus sp, Trichuris sp and Strongyloides sp), cestodes (Monzia sp) and trematodes (Amphistomes and Fasciola sp). It was found evident that Haemonchus sp was the dominant species affecting both sheep and goat flocks. Next to it, the animals were affected with the trematode Amphistomes. The results of season wise infection of helminthes in both sheep and goat flocks are summarized in Table. 3 and figure.3. Out of three seasons, higher percentage of infection was detected during rainy season (68.36%) followed by winter (60.84%). However, during summer infection was moderate in both goat and sheep flocks (55.30%). The season wise infection percentage for different seasons was displayed in Fig. 3. As shown in figure, sheep flock has witnessed highest infection percentage than goat for all the three seasons.

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The present study indicated that the infection with gastrointestinal helminthes is a frequent phenomenon among the small ruminants of coastal districts of Tamil Nadu, India. The higher incidence of parasites in different study areas of Tamil Nadu were reported by many researchers [7, 8, 14, and 15]. The observed results were also in agreement with the findings of various authors from other parts of India[9, 10, 11, 16, 17].

The various species of parasites recorded in the present study coincided with the findings of various authors [18, 19, 15].

The seasonal occurrence of parasitic infection in small ruminants depicted higher infection of helminthes in rainy season followed by winter than in summer. This is in accordance with findings of other researchers [5, 20]. Heavy rainfall and high relative humidity predisposed to heavy parasitic infection [21]. Climatic factors also influenced dispersion of larvae in the herbage which increased the chance of contact between host and larvae [22, 23]. Higher infection during rainy season may also be attributed to suitable molarity of salt present in soil, an important factor for ecdysis [24].

IV. CONCLUSION

From the above findings it was observed that the infections of gastrointestinal parasites among small ruminants were most prevalent throughout the year in organized and small holding flocks in varying intensity. Hence, appropriate strategic treatment with broad spectrum anthelmintic should be practised during the start and end of rainy season. Such treatment regime is strategic to get rid of the parasitic burden in the small ruminants and also minimize the pasture contamination by reducing faecal egg counts.

ACKNOWLEDGEMENT

The authors are thankful to the Authorities of the University for the Facilities provided, the sheep and goat farmers for collection of samples and the staff of Division of Animal Husbandry for their cooperation in examination of samples.

REFERENCES


AUTHORS

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Second Author – R. Vijayalakshmi, Division of Animal Husbandry, Faculty of Agriculture, Annamalai University, Annamalai Nagar – 608 002.Tamil Nadu, India.

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Table. 1 The flock wise analysis of helminth infection

<table>
<thead>
<tr>
<th>Animal</th>
<th>No. of samples collected</th>
<th>No. found positive</th>
<th>Infection (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep</td>
<td>600</td>
<td>398</td>
<td>66.33</td>
</tr>
<tr>
<td>Goat</td>
<td>756</td>
<td>436</td>
<td>57.67</td>
</tr>
<tr>
<td>Overall</td>
<td>1356</td>
<td>834</td>
<td>61.50</td>
</tr>
</tbody>
</table>

Fig. 1 The flock wise analysis of helminth infection

Table. 2. Species wise prevalence of gastrointestinal helminthes in sheep and goats

<table>
<thead>
<tr>
<th>SL.No.</th>
<th>Species</th>
<th>No. of animals examined</th>
<th>Total positive</th>
<th>Infection percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Haemonchus sp</em></td>
<td>1356</td>
<td>623</td>
<td>45.94</td>
</tr>
<tr>
<td>2</td>
<td><em>Trichuris sp</em></td>
<td>1356</td>
<td>179</td>
<td>13.20</td>
</tr>
<tr>
<td>3</td>
<td><em>Strongyloides sp</em></td>
<td>1356</td>
<td>187</td>
<td>13.79</td>
</tr>
<tr>
<td>4</td>
<td><em>Monizia sp</em></td>
<td>1356</td>
<td>165</td>
<td>12.16</td>
</tr>
<tr>
<td>5</td>
<td>Amphistomes</td>
<td>1356</td>
<td>327</td>
<td>24.11</td>
</tr>
<tr>
<td>6</td>
<td><em>Fasciola sp</em></td>
<td>1356</td>
<td>228</td>
<td>16.80</td>
</tr>
</tbody>
</table>
Fig. 2 Species wise prevalence of gastrointestinal helminthes in sheep and goats.
Table. 3 Season wise occurrence of helminth infection in small ruminants

<table>
<thead>
<tr>
<th>Season</th>
<th>Goat</th>
<th></th>
<th>Sheep</th>
<th></th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.of samples collected</td>
<td>No.found positive</td>
<td>Infection (%)</td>
<td>No.of samples collected</td>
<td>No.found positive</td>
</tr>
<tr>
<td>Winter</td>
<td>252</td>
<td>147</td>
<td>58.33</td>
<td>200</td>
<td>128</td>
</tr>
<tr>
<td>Summer</td>
<td>252</td>
<td>124</td>
<td>49.20</td>
<td>200</td>
<td>126</td>
</tr>
<tr>
<td>Rainy</td>
<td>252</td>
<td>165</td>
<td>65.47</td>
<td>200</td>
<td>144</td>
</tr>
</tbody>
</table>

Fig. 3 Season wise occurrence of helminth infection in small ruminants