ORIGINAL ARTICLE

PARASITE COMMUNITIES IN MOROCCAN GOAT (CAPRA HIRCUS) FROM ORIENTAL REGION

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ABSTRACT

Background: The parasitic infections pose serious problems to small ruminant production in the developing world. **Objectives**: the specific objectives of this investigation assessed the gastrointestinal parasitic infection in goats in oriental zone of Morocco. **Methods:** The study was carried out on 120 goats from various sites of eastern zone in Morocco from October 2013 to September 2014. The faecal samples were collected from the rectum of the goats, and were then immediately taken to the laboratory for examination for gastrointestinal nematode, cestode, and trematode eggs, as well as protozoan oocysts. These samples were subjected to simple sedimentation method. Identification was based on the morphological characters of its eggs under the 100 × objective, with the aid of taxonomic keys. **Results:** Among the analysed samples 75 % were positive for endoparasites. The parasites found in goats were nematodes, cestodes, trematodes and protozoas, *Eimeria caprina* and *Eimeria caprovina* are reported for the first time in oriental province of Morocco. In addition, the fasciola and schistosoma species do not parasitize any of the 120 analyzed goats. In this study, age, season and region were identified as risk factors for GI parasitic infections.**Conclusions:** The fecal samples examined revealed an overall prevalence of 90 (75 %) in goats harbor one or more genera of helminths with nematodes being the most prevalent helminths. Zero percent prevalence of *Eimeria caprina, Moniezia expansa, Trichuris ovis, Haemonchus contortus, Paramphistomum cervi* was detected in Bouanane, Bouarfa and Talsint. The study further revealed that a Béni Tajjit area was characterized by strong parasitic load. Hence significantly higher prevalence was revealed of parasite infection in spring season.
Keywords: *Faecal eggs, gastrointestinal helminthes, Eimeria, Goats, Morocco.*

1. INTRODUCTION

During the last two decades, there has been remarkable growth in the goat industry and currently about one billion goats are being reared for meat and milk production worldwide. It is evident that the goat industry is not only playing a big role in the nutritional security of small farmers in many poor countries but also assures working opportunities for a sizeable population around the world. In Morocco Small ruminants have an important economic and social role. There are 781,563 farms practicing sheep production, representing 52% of all agricultural farms and 71% of all livestock farms (all species). Farms practicing goat production number 301.897, representing 20% of total agricultural farms and 27% of livestock farms. The effective of goats in Morocco is about 5.14 million heads, among which 22.6 % are males and 77.4 % of the females among which 57.1 % are of 2 and more years old [1,2, 3, 4].

Boujenane (2005) showed that the goat population is composed of a small number of breeds or often heterogeneous local populations, but well adapted to their habitat [5]. Small ruminants managed under extensive and intensive production systems are extremely susceptible to the effect of wide ranges of endoparasites. However, reproductive and production performances low. Several factors such as poor nutrition and diseases account for low productivity in small ruminants. Helminth infection is one such key factor, as it constitutes one of the most important constraints to small ruminant production. The parasitic infections pose serious problems to small ruminant production in the developing world [6].

A comprehensive understanding of parasite epizootiology is crucial for the sustainable control of parasites that interact with hosts in a specific climate, management system and production environment.
The control of helminthes and protozoas infection in small ruminants, therefore, requires serious attention to increase their productivity and to improve the livelihood of farmers. The specific objectives of this investigation assessed the gastrointestinal parasitic infection in goats in oriental zone of Morocco.

2. MATERIALS AND METHODS

2.1The study site description: The study concerns the territorial extent of four rural communes within high plateaus of eastern Morocco, commonly known by the range of courses and small ruminant conducted in extensive mode. The soils of the area are brown isohumic formed of quaternary deposits and the tertiary limestone substrate. The climate of the area is Mediterranean with bioclimatic decreasing gradient from north to south, from semi-arid to arid and lower pre-Saharan. Rainfall is low and irregular; they ranges from 100-250 mm / year and Average annual temperature varies from 19 ° C to - 4 ° C and the maximums average of about 42.5 ° C [7].

2.2 Sampling Technique: The study was carried out on 120 goats from various sites of eastern zone in Morocco from October 2013 to September 2014.
The faecal samples were collected from the rectum of the goats, and were then immediately taken to the laboratory for examination for gastrointestinal nematode, cestode, and trematode eggs, as well as protozoan oocysts. These samples were subjected to simple sedimentation method. The recovered sediment was then examined under a light microscope [8, 9].

2.3 Identification: Identification was based on the morphological characters of its eggs, shapes, sizes, and nature of shell (thickness), stage in development appearance of embryo if present under the 100 × objective, with the aid of taxonomic keys. But in a situation where the examination of the collected faeces is not possible, 10% formaline is added immediately to hinder further development of the eggs and kept in a cupboard or the sample can be placed in a refrigerator overnight and examined later [10,11,12].

2.4 Statistical analysis: Simple random sampling or lottery method was conducted to collect the fecal sample from individual study animals. Since there was no record of previous prevalence in the study area, the sample size was determined by taking 50% expected prevalence using the formula described by [13]. Percent prevalence of different species of helminths was calculated by the following formula (1):

$$\% \text{ Prevalence} = \frac{\text{Number of samples positive}}{\text{Total number of samples examined}} \text{ x } 100 \qquad (1)$$

In order to identified association between independent variables (study areas and season) and parasitism, a Principal Component Analysis (PCA) was used (XLStat).

3. RESULTS

120 faecal Samples were screened during the studying period. 90 (75 %) were found to be positive for the endoparasite infections. The prevalence rate helminthes for the different classes of helminthes and protozoa showed that 80 (89 %) were found to be positive for nematode positive, 11 (12.2%) were infected with trematode, cestode 50 (55 %), and coccidia 35 (39%) (Table 1).

Table 1: The table presents the overall Helmintic and protozoa prevalence rate.

Number of No of sample Examined	Number of infected positive samples	Percentage infected	parasite class	Number of infected host	Percentage (%)
120	90	75 %	Nematode	80	89 %
			Cestode	50	55 %
			Trematode	11	12.2%
			Coccidia	35	39%

The spectrum of the GI parasites observed in goats comprised *Trichostrongylus colubriformis* (52.50%), *Skrjabinema ovis* (42,50%), *Trichuris ovis* (23.33%), *Nematodirus spathiger* (18.33%), *Haemonchus contortus* (15.83%), *Moniezia expansa* (19.16%), *Paramphistomum cervie* (20%) and 2 species of protozoa of the genus Eimeria, *Eimeria caprovina* (65%) et *Eimeria caprina* (9.16%). In the present study nematode infections were high prevalent followed by coccidia, trematodes and cestodes (Table 2).

Table 2: The table presents the prevalence of various endoparasite species in 120 examined goat (*Capra hircus*).

Parasite species		Infested host	Prevalence (%)
Nematodes	*Trichostrongylus colubriformis*	63	52.50
	Skrjabinema ovis	51	42.50
	Trichuris ovis	28	23.33
	Nematodirus spathiger	22	18.33
	Haemonchus contortus	19	15.83
Cestodes	*Moniezia expansa*	23	19.16
Trematodes	*Paramphistomum cervie*	24	20.00
Protozoa	*Eimeria caprovina*	78	65.00
	Eimeria caprina	11	09.16

In the present study, the proportions of goats infected with various parasites differ significantly between local and imported animals for most parasites. Higher prevalence of gastrointestinal parasites was observed in goats in Béni Tajjit. Among which *Trichostrongylus colubriformis* was the most predominant specie in different areas. No infection of *Eimeria caprina, Moniezia expansa, Trichuris ovis, Haemonchus contortus, Paramphistomum cervie was detected* in Bouanane, Bouarfa and Talsint. This result could be attributed to difference in the management system (Table 3).

Table 3: The table presents the prevalence of various endoparasite species in the various sites from Figuig province (Eastern region, Morocco).

Parasite species		Sample areas (Total N= 120)			
		Béni Tajjit	Bouanane	Bouarfa	Talsint
		Sample examined for each site was (n= 30)			
Nematodes	*Trichostrongylus colubriformis*	22.26	13,65	11.24	5.35
	Skrjabinema ovis	14.23	11.5	13.02	3.75
	Trichuris ovis	09.33	06.68	07.32	----
	Nematodirus spathiger	08.22	05.51	01.60	3.00
	Haemonchus contortus	05.95	05.55	04.33	----
Cestodes	*Moniezia expansa*	12.76	04.15	----	2.25
Trematodes	*Paramphistomum cervie*	08.90	06.45	04.65	---
Protozoas	*Eimeria caprovina*	21.20	19.45	17.23	7.10
	Eimeria caprina	05.20	---	03.96	---

The analysis in main component (PCA) gives indications on factors related to parasite distribution and the saesonal variation of the parasitic diseases (Figure 1 B). The parasite infestations are correlated with the factorial axis F1. It comes out from this multivariate analysis a positive association beteween the parasitic infestation and the number of parasite p1 (*Trichostrongylus colubriformis*), p2 (*Nematodirus Spathiger*), p3 (*Haemonchus contortus*), p8 (*Eimeria caprovina*) and p4 (*Skrjabinema ovis*). The axis F2 describes the parasitic load p5 (*Trichuris ovis*) and p7 (*Paraphistomum Cervie*). *Moniezia expansa* and *Eimeria caprina are* correlated negatively with the parasite load parameters of *Capra hircus.* This result is confirmed besides by a test of correlation (R = 0.75, P = 0.05).

In addition, the temporal variation was identified as risk factors for GI parasitic infections; the global analysis allows defining a typology dominated by the individualization of three groups of parasites GI, GII, GIII (Figure 1 C). The group (GI) includes the circle C1 (Béni Tajjit) situated in a zone with strong parasitic load, which is characterized by a strong agricultural activity which are at the origin of the presence of the parasites in this zone.

However the group (GIII) represented by the circle C2 (Bouanane) and C3 (Bouarfa). It is characterized by an average parasitic infestation connected to the big zone grazing. Between both is situated the group II (GII) represented by the circle C4 (Talsint), Characterized by a low parasitic infestation.

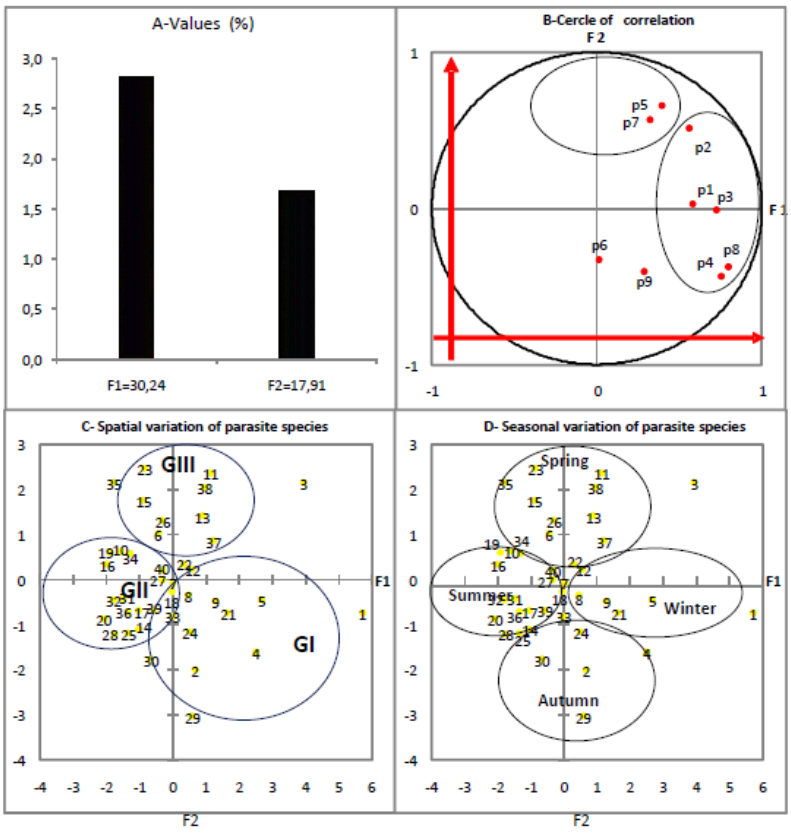

Figure 1: The figure presents the principal Component Analysis of *Capra hircus* from four areas from Figuig province Morocco.

4. DISCUSSION

The fecal samples examined revealed an overall prevalence of 90 (75 %) in goats harbor one or more genera of helminths with nematodes being the most prevalent helminths. The results of coprological examination in goats have also shown the presence of helminthes and coccidia several in different areas and polyparasitism infestation. Zero percent prevalence of *Eimeria caprina, Moniezia expansa, Trichuris ovis, Haemonchus contortus, Paramphistomum cervie* was detected in Bouanane, Bouarfa and Talsint. This result could be attributed to difference in the management system. The study further revealed that Beni Tajjit was characterized by strong parasitic load, and the parasitic load in the spring season is significantly higher than the summer season.

Adrein et al. (2001) observed that nematode are always more prevalent than trematodes and cestodes in ruminant, the reasons are that nematodes do not require intermediate hosts and both larval and adult stages are all infective stages of the parasite [14]. Trematodes and cestodes however recorded lower rates and lower diversity. This is because they require intermediate hosts to complete their life cycle and so transmission is dependent on the availability of intermediate host (*Lymnaea Spp*) and snails are dependent on season for survival [11].

In addition, the Poliparasitismus and infection with gastointestinal helmints were established at all examined animals. The various species of parasites recorded in the present study coincided with the findings of various authors [15, 16]. Our research is characterized by the absence of certain parasites. Indeed, the fasciola and schistosoma species do not parasitize any of the 120 analyzed goats. These helminthes parasites cause fascioliasis and schistomiasis in man. High infestation of goats with these parasites suggests the possibility of future out break if appropriate control measures are not undertaken. Areas suspected to be infested with schistosome species should be avoided while grazing animals and environment where goats are kept should be devoid of snails which are the intermediate host [17, 18]. Eimeriosis is the most important parasitic infection in small ruminants worldwide and it also causes problems in cattle, sheep, and goats. The disease may occur under stress factors such as weaning, dietary changes, inclement weather, or travel and regrouping. In this study, *Eimeria caprina* and *Eimeria caprovina* are reported for the first time in oriental province of Morocco.

The seasonal occurrence of parasitic infection in goats depicted higher infection of helminthes in rainy season followed by winter than in summer. The rainfall and relative humidity appears to be the main factors correlated with the seasonality of the gastrointestinal parasites distribution where temperature showed no significant positive or negative correlation with

GIT nematodes in the study area. The lowest prevalence observed from autumn season up to the end of summer indicated clearly the environment of the dry season unfavorable for the development and survival of the extra host stages of the GIT parasites parasites [14, 15, 16].

5. CONCLUSION

In conclusion, the present study reported high prevalence; the season was an important factor that influences risk of Eimeria and gastrointestinal helminthes infections and multiple infections in the goats from oriental region of Morocco, and the need to strengthen existing control measures and institute additional planning Pasture and grazing management and other prophylactic strategies for sheep and goats in the study area ones to curb the problem. Thus, further studies on species-based prevalence and larval ecology are recommended in order to design appropriate control measures.

6. REFERENCES

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