www.roavs.com ISSN: 2223-0343 (ONLINE)
RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES

Seasonal prevalence of *Strongyle* in Creole goats of the Tierra Caliente region, State of Guerrero, Mexico

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Abstract

The prevalence of adult gastrointestinal parasites belong to genus *Strongyles* was determined in Creole goats in the four seasons (summer, fall, winter and spring). For this purpose, 40 Creole waste goats, were used. In each annual season ten goats slaughtered and the total digestive organs were collected to be examined according to standard procedures. The genera of epidemiological importance were *Haemunchus contortus* (70.0%), *Trichostrongylus colubriformis* (87.5%), *Oesophagostomum columbianum* (45.0%) and *Cooperia punctata* (40.0%). The total load of adult parasites per goat was higher ($P<0.0001$) in summer and fall seasons. Rainfall was positively correlated ($r=0.41$) with the parasitic load in goats. It was concluded that the parasitic load in Creole goats was higher during most rainy season and the control must be focused on *H. contortus*, *T. colubriformis*, *O. columbianum* and *C. punctata*.

Keywords: Goats; seasons; *Strongyles*; Mexico

To cite this article: Perez JO, IG Segura, SR Hernandez, MTV Almazan, EJM Martinez and AC Izquierdo, 2012. Seasonal prevalence of Strongyle in Creole goats of the Tierra Caliente region, State of Guerrero, Mexico. Res. Opin. Anim. Vet. Sci., 2(3), 216-220.

Introduction

The favorable tropical climatic conditions help in growth of larvae of gastrointestinal nematodes (GIN) in pastures (Rumosa et al., 2009). Grazing goats ingest infective larvae, which cause different parasitism (Hoste et al., 2005; Knox et al., 2006).

Gastrointestinal nematodes cause significant loss in goat production due to their adverse effects at subclinical such as decreased appetite, weight loss, hypoproteinemia, decreased digestive efficiency and other pathogenic clinical complications leading to decreased productivity, blood loss, reduced minerals, depression in some intestinal enzymes activity, diarrhea and death of the kids (Martinez-Gonzalez et al., 1998; Miller and Horohov, 2006).

The research generated about prevalence and identification of parasites' genera is very important for prevention and control (Thrusfield, 1995). This study aims to identify the adult parasites of the *Strongyles* order in goats. To determine the parasite load and prevalence during the four seasons (summer, fall, winter and spring) in the tropics of Tierra Caliente region of the State of Guerrero, Mexico.

Materials and Methods

Description of the study area

The study was performed over a year, in the Tierra Caliente region of the State of Guerrero, Mexico, located at 18º 20' 30" north latitude and 100 º 39’ 18” West longitudes (Garcia, 1973).

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The climate that prevails in most of Tierra Caliente is the driest of the warm sub-humid, summer rains (June 21 to September 20). The average temperature and rainfall registered at different periods of the year during the development of the study were summer 28.2°C, and 241.5 mm, fall 25.7°C, and 25.2 mm, winter 28.6°C, and 0.73 mm and spring 34.6°C, and 47.3 mm (Fig. 1).

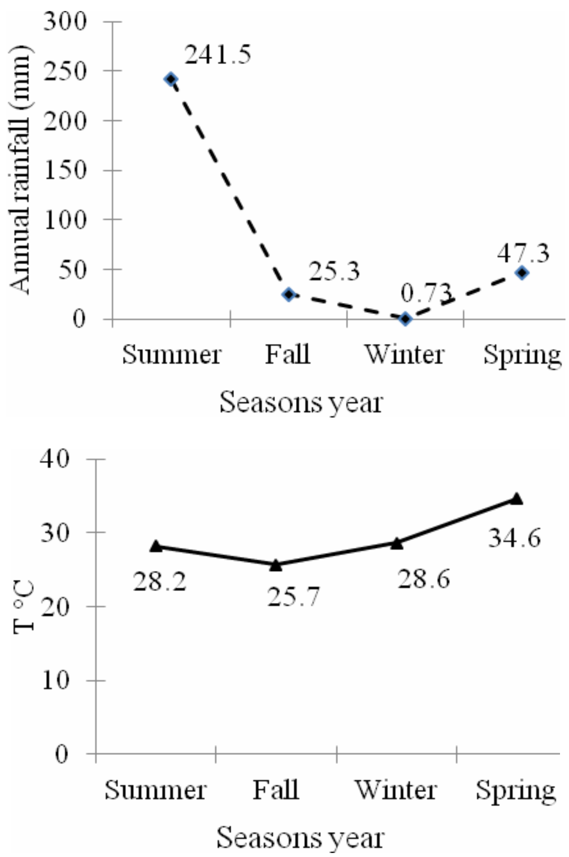

Fig. 1: Rainfall and average temperature (T) registered during the different seasons of the year in the Tierra Caliente region of the state of Guerrero, Mexico.

Study animals and sample collection

Forty Creole waste goats (six years old and live weight of 45.0±3.5 kg) bred extensively in grazing were used. From ten goats in each season, digestive organs (abomasums and small and large intestines) were collected. The digestive organs were removed from the abdominal cavity and immediately taken to the Laboratory of Veterinary Parasitology of Academic Unit of Veterinary Medicine for the appropriate examination.

Recovery, identification and count of adult parasites

The classical procedure as described in MAFF (1977) and Hansen and Perry (1994) were employed for the recovery of *Strongyles* in digestive organs. Briefly, the contained digestive organs were washed into a bucket up to a total volume of 2 L from an aliquot of 200 mL was transferred to a labeled graduated beaker, and preserved in 10% formalin. A sub sample of 20 mL was taken into a Petri dish for examination of adult *Strongyles* under a stereomicroscope (Carl Zeiss 475002, Germany). In positive samples, the number of adult *Strongyles* was determined by multiplying 20 mL (aliquot) at 100 (factor) as described by Hansen and Perry (1994).

The identification of genus and species of adult parasites *Strongyles* order was performed by specific morphological characteristics of parasites observed under the microscope (Carl Zeiss Axio-Lab., Germany) according to the procedures described by MAFF (1977), Hansen and Perry (1994) and Jacquiet et al. (1997).

Statistical analysis

The total parasite load (adult gastrointestinal nematodes) of goats in the seasons and number of parasites by gender data were analyzed by General Linear Models using the SAS (2002) and the Tukey's test to compare averages.

The statistical design used was completely randomized 4 x 6 factorial arrangement

Statistical model:

$Y_{ijk} = \mu + A_i + B_j + (A * B)_{ij} + E_{ijk}$

Where:

Y_{ijk} = response variable (number of adult parasites) in the repetition (k = 1, 2, 3 ... 10 goats digestive organs), level *i* of (A = 1, 2, 3, 4 seasons year) and level *j* (B = 1, 2, 3 ... 6 parasitic genus)

μ = general mean

A_i = effect of factor A (season) to the level *i*

B_j = effect of factor B (parasitic genus) at level *j*

$(A * B)_{ij}$ = interaction effect A * B at level *i, j*

ξ_{ijk} = random error

With the temperature, rainfall and parasitic load data, a correlation analysis (r), where climatic variables were independent and the parasite load was dependent, was done in both tests (SAS, 2002) was used. The prevalence of parasitic genus was calculated by the following equation:

Prevalence % = n° organs in which each parasite appeared/n° of organs sampled (100)

Results and Discussion

Table 1 shows the principal genera of the GIN parasitic *Strongyles* order identified in Creole goats in different seasons were *Haemunchus contortus*, *Trichostrongylus colubriformis, Oesophagostomum columbianum*, *Cooperia punctata, Bonostomum phlebotomum*, and *Ostertagia spp*.

Table 1: Average parasite load by genus (gastro-intestinal adult nematodes *Strongyles*) in goats in the different seasons in the tropics of Tierra Caliente Gro., Mexico

Identified adult Parasites	Seasons years	Parasite Load (n°)	Annual average
H. contortus	Summer	1319^{a}	561.7
	Fall	432^{c}	
	Winter	298^{d}	
	Springer	198^{ef}	
T. colubriformis	Summer	765^{b}	516.3
	Fall	754^{b}	
	Winter	254^{de}	
	Springer	292^{d}	
C. punctata	Summer	477^{c}	146.7
	Fall	-	
	Winter	62^{g}	
	Springer	48^{hg}	
O. columbianum	Summer	166^{f}	83.0
	Fall	64^{g}	
	Winter	2^{h}	
	Springer	100^{g}	
B. phlebotomum	Summer	-	1.0
	Fall	4^{h}	
	Winter	-	
	Springer	-	
Ostertagia spp	Summer	-	1.0
	Fall	-	
	Winter	-	
	Springer	4^{h}	
P<Value	Season years	<0.0001	
	Parasitic genus	<0.0001	
	Season × Genus	<0.0001	

$^{a-g}$ Values in the same column with different superscript are significantly different (Tukey Test)

The most important epidemiological parasites (P<0.0001), assessed in goats during the seasons were *H. contortus* (summer = 1319, fall = 432, winter = 298, and spring = 188 adult parasites respectively), and *T. colubriformis* (summer = 765, fall = 754; winter = 254, and spring = 292 adult parasites) representing an annual average load of 559.3 and 516.2 adult parasites (Table 1). On the other hand, *B. phlebotomum* and *Ostertagia spp.* were found only in spring and fall respectively (Table 1).

In particular the significant decrease (P<0.0001) of the parasitic load of *H. contortus*, *T. colubriformis*, *C. punctata*, and *O. columbianum* from the higher rainfall seasons (summer) to the lower ones (fall, winter and spring) (Fig. 1) was enough to show an interactive effect of the seasons and genus (P<0.0001) on the parasitic load (Table 1). The findings were similar to those reported by Kumssa and Wossene (2006) and Pathak and Pal (2008). It was also observed, based on annual average parasite loads (Table 1), that the genera *H. contortus*, *T. colubriformis*, *C. punctata,* and *O. columbianum* were partly responsible for the production losses and death in goats (Rumosa et al., 2009). Because the goats used in the study were clinically infected by parasites according to the doctrine described by Hansen and Perry (1994), so there is a positive relationship between egg counts and the number of adult parasites (Roberts and Swan, 1981).

Figure 2 illustrates the behavior of the total GIN adult parasitic load in different seasons evaluated in goats. It is clear that the average adult parasite load per animal was higher (P<0.0001) during summer and fall. In the correlation analysis, it was observed that rainfall had a significant positive correlation (r=0.41) with the parasitic load observed in goats during different seasons, which means that the highest rainfall in summer and humidity in fall are favorable conditions for parasites to complete their biological cycle and give the animal re-infestation (Fig. 2). This behavior has been attributed to climatic conditions such as humidity determined by rainfall and temperature (Sajid-Ali et al., 2000; Kumsa and Wossene, 2006; Pathak and Pal, 2008; Rumosa et al., 2009; Bandyopadhyay et al., 2010; Akhter et al., 2011). At the same time increase in the availability of grass in meadows, which serve as an ecological niche for parasite is also indirectly responsible (Regassa et al., 2006; Al-Shaibani et al., 2008).

The ambient temperature showed a lightly negative correlation with the parasitic load observed in animals (r=-0.18). It was not decisive for the differences to be observed in the average load per animal in all seasons (Fig. 2). This was due to the temperature recorded in the seasons during the study (Fig. 1). In such optimal temperature range (25-35°C), fertility of parasites prevalent in tropical regions is not affected (Hansen and Perry, 1994; Sajid-Ali et al., 2000).

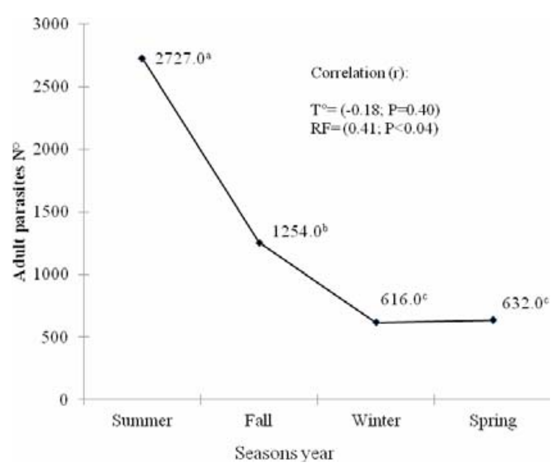

Fig. 2: Total parasite load (GIN adult nematodes *Strongyle*) of goats and its correlation with temperature (T°) and rainfall (RF) in different seasons in the tropics of Tierra Caliente of Guerrero, Mexico.

Figure 3 shows that during the year of assessment, the most prevalent parasitic genera in Creole goats were *T. colubriformis,* and *H. contortus*, 87.5% and 70.0% respectively, followed by *O. columbianum*, and *C. punctata*, 45.0% and 40.0% respectively; and finally genera *B. phlebotomum* and *Ostertagia spp*. Several studies have reported the same parasitic genera in goats (Nwosu et al, 2007; Raza et al., 2007; Ijaz et al, 2008 Pathak and Pal, 2008; Gadahi et al., 2009; Rumosa et al., 2009; Biu et al., 2009; Bandiopadhyay et al., 2010; Hassan et al., 2011).

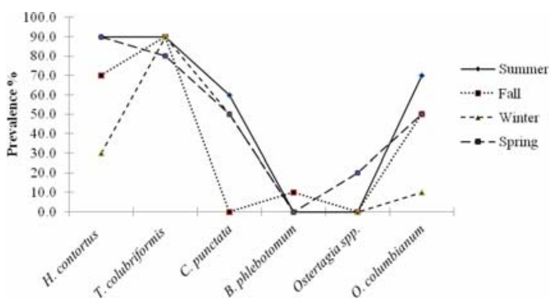

Fig. 3: Prevalence in goats of gastro-intestinal adult nematodes *Strongyle*, in different season's year in the tropics of Tierra Caliente of Guerrero Mexico

In general the highest prevalence (Fig. 3), and parasite load (Table 2) observed in genera *H. contortus* and *T. colubriformis* are due to the high fertilization and prolificacy of these parasites (*H. contortus* = 5000 to 10,000 eggs/day/female, and *Trichostrogylus* spp from 500 to 2000 eggs/day/female), and their ability to survive in a wide range of humidity and temperature (Hansen and Perry, 1994; Akchter et al., 2011).

Conclusion

The parasites identified in the digestive system in this study were *H. contortus*, *T. colubriformis*, *O. columbianum*, *C. punctata*, *B. phlebotomum* and *Ostertagia* spp. The most important epidemiological parasites in goats were *H. contortus*, *T. colubriformis*, *O. columbianum* and *C. punctata*. The parasitic load of goats was higher during rainfall. So a control program in summer and fall must be designed.

Acknowledgment

The authors thank the producers of goats and cattle association "Pungarabato" by supporting and facilitating the conduction of this study.

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