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STRONGYLE MONITORING IN A FLOCK OF THE NATIVE ZERASCA SHEEP BREED

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Abstract
Gastrointestinal parasites compromise the welfare and health of ruminants on pasture, causing serious productive losses. The constant and preventive strategy of anthelmintic treatments results in several problems, such as parasite resistance and food and environment contamination. Sustainable approaches to tackle such problems primarily involve knowledge of the dynamics and impact of parasites in the flock. The aim of this study was to monitor the gastrointestinal parasite burden together with the body condition score (BCS) in a flock of a local Italian sheep breed. The two-year study involved an unchanged sample of 20 pluriparous ewes randomly selected in a farm located in the homonymous area. Chemical anthelmintic treatment had been administered three months before the beginning of the study, following a mean infestation level of 298±276.5 eggs per gram (EPG). Faecal samples were collected every two months to evaluate the faecal egg count (FEC) with a modified McMaster technique. Egg dynamics were statistically analysed and data were logarithmically transformed to normalize the variance. FEC results were grouped into four classes of infection for a statistical description. The BCS was measured on a five-point scale. Results showed a significant fluctuation in FEC (from 52 to 320 EPG), however no clear relationship with the season was found. Mean values were always under the threshold of health risk and only in one case did values exceed 300 EPG. The overall BCS was nearly 3, thus revealing no nutritional problems. The study highlighted that by monitoring gastrointestinal strongyles in a farm with good farming practices, chemical treatments can be limited to only those cases that are strictly necessary.

Key words: *BCS, gastrointestinal strongyle, monitoring, sheep, Zerasca breed.*

INTRODUCTION

In small ruminants, breeding management is mainly based on extensive systems, and pasture is the environment where gastro-intestinal parasites complete their biological cycle. Thus, controlling the parasite burden is a basic goal in limiting the constraints of animal health and welfare (Liu et al., 2005). Both adult parasites and larvae can cause severe damage to internal organs, modifying their functionality and establishing digestive problems and malabsorbtion when there is an imbalance between the host and parasite. These alterations together with inflammatory reactions and a deduction of nutrients and sometimes blood, inevitably affect the sheep's metabolism thus compromising its health and welfare (Cabaret et al., 2002). Clinical manifestations occur especially among young animals. However, the subclinical forms are more worrying. This is because of the higher incidence of productive and economic losses as a consequence of the reduced or defective growth of young animals and the lower productive performances in adult sheep.

Chemical drugs are frequently used without previous laboratory results. The widespread use of conventional drugs in farm animals could result in anthelmintic resistance and in problems connected with the contamination of derivatives products and the environment (Ronchi and Nardone, 2003; Ketzis et al., 2006; Papadopoulos, 2008). Researchers are thus studying strategies that avoid or at least reduce the use of chemicals.

The best approach for the control of the gastrointestinal parasite burden in extensive farming involves the effective management of pastures, the use of breeds well adapted to the environment, and the monitoring of the parasite burden (Benvenuti et al., 2006). In addition, indirect indicators of parasite linked damage such as the body condition score (BCS) are a valid tool to evaluate the effective need of treatment (Kenyon and Jackson, 2012). In fact, the BCS is helpful as an indicator of the nutritional status of animals (Caldeira et al., 2007). It describes the status of a sheep through the assignment of a score based on the fattening level, which is assessed through the visual and tactile examination of the adipose tissue around and on the vertebrae of the lumbar region.

The aim of the study was to monitor the gastrointestinal strongyle burden in a flock of Zerasca sheep, where integrated health management is applied in order to study the strongyle dynamics and limit the use of chemical treatments to the real needs.

MATERIALS AND METHODS

The study was carried out in a flock of Zerasca sheep, named after the homonymous Zeri district, located in north western Tuscany (Italy) at an altitude of 700 m a.s.l. (44°19' N, 9°47' E). The flock consisted of 50 sheep kept in extensive conditions fed on grass and shrub pasture with supplementation provided all year round. The pasture area was 11 ha, managed with rotation based on grass availability. During the night and in unfavourable weather conditions, the animals were kept in a barn with appropriate animal density, good ventilation and dry litter in sufficient quantities. Chemical anthelmintic treatment (Hapadex 5% Schering-Plough, Netobimin, class of pro-benzimidazole, in a single dose of 1.5ml/10kg body weight) had been administered three months before the beginning of the study, following a mean infestation level of 298±276.5 eggs per gram (EPG) with weight loss in adult sheep and colic symptoms in young animals. The study lasted from February 2009 to February 2011, and involved an unchanged sample of 20 pluriparous ewes which was considered as statistically representative of the flock, randomly-selected at the beginning of the study. The animal care procedure followed the European Directives for the Protection of Experimental Animals (Council Directive 2010/63/EU).

Faecal samples were performed bimonthly. Faeces were taken directly from the rectal ampoule and individually examined to estimate the faecal egg count (FEC) of gastrointestinal nematodes expressed as EPG using a modified McMaster technique with a sensitivity of 20 (Permin and Hansen, 1998). On the same dates, the BCS was measured following the five-point scale method suggested by Russel (1984).

Regarding parasite burden fluctuation, statistical analysis was performed by ANOVA with JMP software (JMP, 2002). The factor included in the model was the date of sampling. Data referring to FECs were logarithmically transformed [$y = \log(EPG + 25)$] to normalize errors (Baker, 1997). Results of FEC were grouped into four class of infection (0 = 0 EPG; 1 = 1-300 EPG ; 2 = 301-600 EPG; 3 = more than 600 EPG) (Ambrosi, 1995) for a statistical description.

RESULTS AND DISCUSSIONS

During the study, the overall EPG and BCS means were 124.9±202.84 and 3.0±0.55, respectively. Table 1 summarizes the EPG and BCS mean values. The highest EPG output was observed in September 2010, while during the spring months in 2010, the burden was contained in low values.

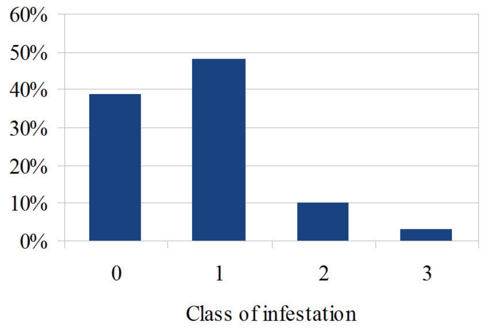
The low egg output was probably related to a good balance between animals and the environment thanks to the managerial practices. The overall EPG mean was lower than those observed in previous studies conducted in other farms with Zerasca sheep reared under similar conditions and not chemically treated (533 and 360 EPG) (Benvenuti et al., 2011; Benvenuti et al., 2012). The EPG fluctuation was statistically significant ($P<0.01$) although no clear influence of seasons was found. The low FEC during the trial probably justifies this atypical fluctuation which exceeded the threshold of zootechnical risk with impairment of productive performance (300 EPG) only in the last sampling (Ambrosi, 1995). This trend did not confirm the usual phenomenon known as spring or fall rise. In fact several reports indicate an increase in FEC output during the spring or the fall (Brunsdon 1970; Urquhart et al., 1996; Falzon et al., 2014) in various sheep breeds including the Zerasca, where a significant increase in EPG from January to March has been observed (Giuliotti et al., 2015).

Table 1. Mean EPG[1] of gastrointestinal strongyle and BCS[2] of ewes during the study

	EPG		BCS	
Sampling	Mean	SE	Mean	SE
February 2009	70.0 DE	49.57	2.8	0,11
April 2009	58.5 E	55.00	3.0	0.07
June 2009	114.3 BCDE	53.00	2.9	0.10
September 2009	252.8 AB	53.00	2.7	0.14
December 2009	154.3 BCD	53.00	2.5	0.18
February 2010	134.3 BC	53.00	3.3	0.15
April 2010	76.4 BCDE	59.79	3.2	0.12
June 2010	52.0 CDE	62.71	3.1	0.21
September 2010	108.6 BCDE	74.95	3.3	0.29
November 2010	120.0 ABCD	70.11	3.1	0.16
February 2011	320.0 A	88.68	2.7	0.25

Means with different letters in the same column were significantly different (P<0.01).
[1]Eggs per gram; [2]Body Condition Score

In our opinion, this situation cannot be fully explained by the weather conditions which are generally characterized by inclement winters and temperate summers, but rather by good managerial practices, especially regarding pasture rotations.
BCS monthly means varied from 2.6 to 3.4 during the study, not highlighting any particular mobilisation of body reserves. The mean BCS value (3.0±0.5) was in agreement with those reported in previous studies (Giuliotti et al., 2015) showing a generally stable situation and a satisfactory nutritional status (Caldeira et al., 2007).
Graph. 1 shows the percentage distribution of four infestation classes within the investigated flock of Zerasca sheep. It is clear that the gastrointestinal strongyle burden had not reached severe levels, but was contained mostly in the first two classes of infestation, corresponding to a low risk for animal health and welfare.
A total of 87% of the tested ewes showed a gastrointestinal strongyle burden at class of 0 (0 EPG) and 1 (1-300 EPG) thus avoiding the risk of decreasing productive performances, and welfare and health risks, which are impaired at over 600 EPG (Ambrosi, 1995).
Only a small percentage of sheep at the last sampling came close to the class of infestation corresponding to a risk for animal health (>600 EPG).



Class of infestation: 0 = 0 EPG; 1 = 1-300 EPG;
2 = 301-600 EPG; 3 = > 600 EPG

Graph 1. Distribution of the infestation classes within the investigated flock of Zerasca sheep

CONCLUSIONS

In conclusion, this study highlighted that an accurate monitoring of parasite burden together with the body condition score evaluation helped to limit the administration of conventional treatments to only those cases where it is really required.
The use of such a control method was able to limit the toxic effects of drug excretion in the environment and the chemical contamination of derivative products.

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