

The effects of five anthelmintic treatment regimens on milk production in goats naturally infected by gastrointestinal nematodes

V. Veneziano¹, R. Rubino², V. Fedele², L. Rinaldi¹, M. Santaniello¹, M. Schioppi¹,
C. Cascone¹, M. Pizzillo² and G. Cringoli^{1#}

¹Dipartimento di Patologia e Sanità Animale, Facoltà di Medicina Veterinaria, Università degli Studi di Napoli "Federico II" - CREMOPAR, Regione Campania, Napoli, Italy

²Istituto Sperimentale per la Zootecnia, Bella Scalo, Potenza, Italy

Abstract

A study was carried out in Southern Italy on 90 Siriana breed goats with naturally occurring infections of gastrointestinal nematodes. Six similar groups of 15 goats were formed, one untreated control group and five groups treated once with ivermectin (I treatment) and once with netobimin (II treatment) at different times. Daily milk volume (mL) was recorded fortnightly for each animal for the whole lactation period. All the treated groups showed a total milk production that was statistically higher than that of the control group, and four of these groups showed at least one fortnightly measurement in which differences from the corresponding values of the control group were statistically significant. The best treatment timing seemed to be October-May, followed by February-June, December-May, and February-May.

Keywords: Goat-helminths, nematode control, milk production, dosing programme

#Corresponding author. E-mail: cringoli@unina.it

Introduction

Gastrointestinal nematodes (GIN) are the most serious problem affecting goat production worldwide (Pugh *et al.*, 1998). The assessment of losses caused by GIN in a given region is imperative for the establishment of sustainable control methods. In dairy goats GIN infection is strongly associated to grazing management and the intensity of faecal egg excretion is negatively correlated to milk production, live weight gain and general farm productivity (Chartier *et al.*, 2000; Faizal *et al.*, 2002). Hence GIN control is of particular economic importance in goat production systems worldwide.

The present study was conducted over a period of a year to compare the benefit of five different timings of anthelmintic treatments on milk production of Siriana goats with natural GIN infection.

Materials and Methods

A native herbaceous pasture in a Basilicata valley, Southern Italy (40°21' N and 15°30'25'' E) at 360 m above sea level was used for this study at the Istituto Sperimentale per la Zootecnia - Bella, located in Potenza province. With about 70% of the annual rainfall of 450 - 700 mm falling in winter and temperature ranges of -6 to 8 °C in winter and 32 °C in summer, the botanical composition changes considerably from one season to another. Grasses (particularly *Lolium perenne*, *Dactylis glomerata* and *Bromus* spp.) predominate in winter and autumn, these species and legumes (*Medicago polymorpha*, *Trifolium repens*, and *Vicia* spp.) in spring, and forbs (*Ranunculus bulbosus*, *Asperula odorosa*, *Daucus carota*, *Geranium molle*, etc.) especially during summer. The goats grazed for eight hours/day and were supplemented with concentrate (150 g CP and 420 g NDF/kg feed), corresponding to 50% of energy requirements. The most dominant GIN observed in the goats on this farm were *Teladorsagia circumcincta*, *Haemonchus contortus*, *Trichostrongylus colubriformis* and *Oesophagostomum venulosum* (Cringoli *et al.*, 2004).

The study was carried out on a total of 90 female Siriana goats, from 2 to 4 years old and 40 - 50 kg body weight. All goats kidded towards the end of February and the beginning of March, 2003. Six similar groups were formed for age, milk production, weight and positive GIN faecal egg counts and

randomly assigned to six groups of 15 animals, one untreated control group and five groups treated once with ivermectin (OramecTM, Merial - I treatment) and once with netobimim (HapadexTM 5%, Shering-Plough - II treatment) as follows: Oct-May (treated in October and May); Dec-May (December and May); Feb-May (February and May); Feb-Jun (February and June) and Feb-Jul (February and July). The dates of treatments in 2002 were 29 October and 13 December, and in 2003, 11 February; 27 May; 26 June; and 26 July.

As suggested by Chartier & Hoste (1997) and Silvestre *et al.* (2002), ivermectin and netobimim were administered *per os* at the dose rate of 0.4 mg/kg body weight and 15 mg/kg body weight, respectively, i.e. twice the therapeutic dosages recommended for sheep. The goats of the control group were subjected to the same handling procedures as those that were treated. A paddock pasture with similar characteristics was used for each group. From the end of November to the end of February the goats were housed because of the adverse climatic conditions, even though they were let out onto pasture on some days towards the end of December. Faecal egg counts were performed on each study animal at the start of the trial (October) and fortnightly from February to the end of the study (summarised to monthly averages in Figure 1). The counts were done using a modified McMaster technique (M.A.F.F., 1986) and with a sucrose flotation medium (specific gravity = 1.250), at a sensitivity of 10 eggs per gram (epg) of faeces. Daily milk volume (mL) was recorded for each animal and the mean per group calculated for each fortnight for the lactation period (May 2003-October 2003) after the kids.

While the geometric mean value was calculated per group, per sampling day for epg counts after these had been transformed to natural logarithms ($\ln(x+1)$), arithmetic means were used for statistical comparisons of milk yields (ml).

As an indication of the best timing of anthelmintic treatment for maximum milk production, milk values of trial groups were tested for significant differences ($P < 0.05$) by analysis of variance, using the following model in the GLM procedure (General Linear Model) of SPSS (SPSS 11, 2000): Milk production model: $Y_1 = I_1 + C_m + C_p + G_n$, where: I_1 = Intercept; C_m = Covariate milk production in 12/05/03; C_p = Covariate epg value in 29/10/02; G_n = Groups ($n = 1 \dots 6$). Covariates were used in order to balance initial differences among groups.

Results and Discussion

The results of the faecal egg counts are summarized in Figure 1.

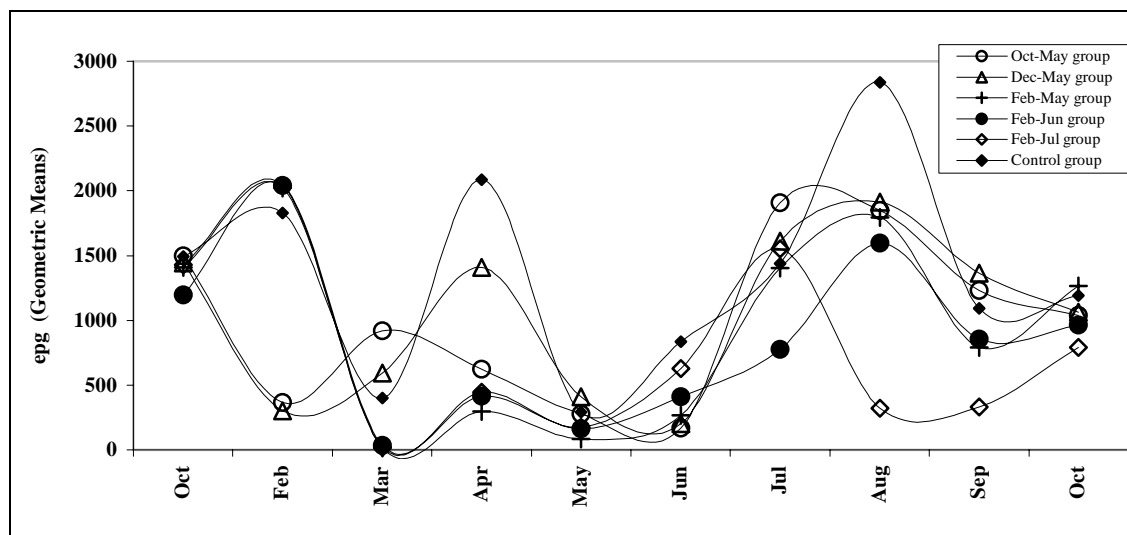


Figure 1 Geometric means of faecal egg count values of the six groups

Both ivermectin and netobimim treatments were effective against GIN at the dose rates used. The results of the fortnightly milk production of each of the six groups over the study are shown in Table 1.

Table 1 Arithmetic means of fortnightly milk production (mL) of the six study groups

Groups	May 12	May 27	Jun 11	Jun 26	Jul 11	Jul 26	Aug 10	Aug 25	Sep 10	Sep 24	Total milk production
Oct-May	1411	765	945*	965*	802*	505	432	400*	395	381	7001*
Dec-May	944	554	612	692	639*	434	360	500*	475	433	5643*
Feb-May	1467	700	928	864	550	518	417	454*	435	360	6693*
Feb-Jun	1451	898	982	914	839*	786*	636	518*	450	467	7941*
Feb-Jul	1491	859	856	787	646	424	412	450	400	290	6615*
Control	909	479	387	393	288	320	320	250	240	225	3811*

*P < 0.05

Although all the treated groups showed a total milk production higher than the control group ($P < 0.05$), only a few of the differences between fortnightly values of the various groups were statistically significant. Among the five treated groups, the Oct-May group showed the greatest number ($n = 4$) of milk production values that were significantly higher ($P < 0.05$) than the corresponding ones of the control group. Similarly, there were three such cases in the Feb-Jun group. For both the above groups the significant differences commenced shortly after the second treatment. Only a few random differences between treated and control group values occurred in the case of the Dec-May and Feb-May groups and none for the Feb-Jul group.

Conclusions

In the present study of goats naturally infected with GIN, each of the five trial groups receiving two anthelmintic treatments produced significantly more milk than the untreated groups. In four of these groups at least one of the fortnightly sets of measurements was significantly higher than the corresponding value of the control group. The best timing of treatment seemed October - May, followed by February - June, December-May, and February - May. The second treatment performed either in May or June, which is the common lactating period of goats in southern Italy, as well as in many other zones, seemed imperative. For these reasons, the availability of anthelmintics with negligible milk residues for goats during the lactating stage would be of great assistance to dairy goat farmers.

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