Famacha method as a tool for selective control of nematode parasites in sheep*

Izabella Cabral Hassum[1]

ABSTRACT. Hassum I.C. **Famacha method as a tool for selective control of nematode parasites in sheep**. [Famacha como ferramenta de controle seletivo da verminose em ovinos.] *Revista Brasileiro de Medicina Veterinária, 36(3):251-254, 2014.* Parasitologia/Saúde Animal, Embrapa Meio-Norte, Avenida Duque de Caxias, 5650, Bairro Buenos Aires, Teresina, PI 64006-220, Brazil. E-mail: izabella.hassum@embrapa.br

Worms constitute a serious health problem that affects sheep herds worldwide, causing significant economic losses and limiting productivity. *Haemonchus contortus* nematode is considered the most important in this context, and control based solely on the use of anthelmintics has not been efficient. Thus, the use of an individual clinic diagnostic methods, such as Famacha, can be a strong ally in the desired control. The study was conducted at Embrapa Southern Region Animal Husbandry, in Bagé, Rio Grande do Sul, Brazil, during the months of March 2009 to April 2010. Pure and crossbred sheep were studied, both male and female, young and old, bred extensively in natural field. The animals were evaluated at intervals ranging from seven days (minimum) to 15 days (maximum), and the treatment was applied to individual animals classified as Famacha grade three, four or five. Additionally, from a total of 27 evaluations, 17 were followed by blood collection for analysis of Packed Cell Volume (PCV) and 20 by individual stool collection. Throughout the evaluation period, *H. contortus* was predominant in the stool. There was negative correlation ($r = -0.454$, $p \leq 0.05$) between Famacha and PCV, and low positive correlation between Faecal Egg Count (FEC) and Famacha ($r = 0.185$, $p \leq 0.01$). On average, 80.5% of the assessments based on Famacha method were correct. It has proved to be a complementary alternative to the selective control of nematode parasites in sheep, reducing the number of applications of anthelmintics and preserving the population of parasites in refugia.

KEY WORDS. FEC, helminth, hematocrit, resistance, small ruminant.

RESUMO. A verminose é um problema sanitário que afeta gravemente rebanhos ovinos em todo o mundo, causando perdas econômicas significativas e limitando a produtividade. *Haemonchus contortus* é considerado o nematóide de maior importância neste contexto, sendo que o controle baseado exclusivamente na utilização de anti-helmínticos não tem sido eficiente. Desta forma, o uso de métodos clínicos individuais de diagnóstico, como o Famacha, pode ser um forte aliado no controle desejado. O trabalho foi realizado na Embrapa Pecuária Sul, em Bagé, durante os meses de março de 2009 a abril de 2010. Foram utilizados ovinos puros e mestiços, machos e fêmeas, jovens e adultos, criados extensivamente em campo natural. Os animais foram avaliados em intervalos mínimos de sete dias e máximos de 15 dias, e os tratamentos foram individuais em animais classificados como graus Famacha três, quatro e cinco. Adicionalmente, de um total de 27 avaliações realizadas, 17 foram acompanhadas de

* Received on September 14, 2012.
Accepted for publication on January 23, 2014.

[1] Médica-veterinária, DSc., Embrapa Meio-Norte, Av. Duque de Caxias, 5650, Bairro Buenos Aires, Teresina, PI 64006-220, Brasil and Embrapa Pecuária Sul Livestock, BR-153, Km 603, Vila Industrial, Zona Rural, Caixa Postal 242, Bagé, RS 96401-970, Brasil. E-mail: izabella.hassum@embrapa.br

coleta de sangue para análise do Volume Globular (VG) e 20 acompanhadas de coleta individual de fezes. Durante todo o período de avaliação, o *H. contortus* foi predominante nas coproculturas. Houve correlação negativa (r = -0,454; p ≤ 0,05) entre Famacha e VG, e baixa correlação positiva entre Ovos por Grama (OPG) e Famacha (r = 0,185; p ≤ 0,01). Em média, 80,5% das avaliações pelo método Famacha foram acertadas. Assim, evidencia-se este método como alternativa complementar no controle seletivo da verminose em ovinos, reduzindo o número de aplicações de anti-helmínticos e, consequentemente, preservando a população de parasitos em refugia.

PALAVRAS-CHAVE. Helminto, hematócrito, OPG, resistência, pequeno ruminante.

INTRODUCTION

Sheep raising is a very traditional activity practiced in the state of Rio Grande do Sul, Brazil, where nowadays wool exploitation divides its importance with sheep meat production. Regardless of the different kinds of production systems in the region, health of the herd is fundamental to a successful raising. Worms, in this sense, are a constant worry for sheep producers, since the diseases they cause affect direct and indirectly the productivity.

Haemonchus contortus is considered the most relevant nematode among gastrointestinal parasites. It can cause severe anemia, hypoproteinaemia, weight loss, weakness and even death of the host. Haemonchosis is often more severe in young animals, although adults can also be seriously affected.

In southern Brazil strategic control of nematode parasites has been widely used by sheep farmers until the emergence of parasites resistant to anthelmintics. In the 90s, cases of multiple anthelmintic resistance in the region were documented (Echevarria et al. 1996). The selection pressure caused by frequent exposure of the populations of nematodes to drugs has seriously affected this type of control. The use of worm control measures that promote the increase of parasites in refugia, such as those which treat animals selectively, can maximize the life span of anthelmintics in herds (Kaplan et al. 2004). Thus, Famacha method can be an ally in the control of gastrointestinal nematodes in sheep.

MATERIALS AND METHODS

The study was conducted at Embrapa Southern Region Animal Husbandry, in Bagé, Rio Grande do Sul, Brazil, from March 2009 to April 2010. Bagé is located in the southern half of Rio Grande do Sul, latitude -31° 34′ 78′′, longitude -54° 01′ 33′′, 31° 19′ 43′′ South and 54° 6′ 26′′ West. Altitude is 230 m and climate is humid subtropical (Climatic classification of Köppen-Geiger: Cfa). The coldest month is July, with an average temperature of 12 °C, and the warmest month is January, with 24 °C. In regard to rainfall, the annual average volume is 1.472 mm, evenly distributed throughout the year, with some occasional droughts.

Pure and crossbred sheep - from Ideal, Corriedale and Crioula races - were studied in this experiment, both male and female, young and old, reared extensively in natural fields at Embrapa. At the beginning of the study, there were 40 sheep; however, there was a decrease in the number of animals, caused by the attack of dogs that occured on the farm.

An average of 33 sheep were evaluated by Famacha method, comparing the color of ocular mucosa to the model chart, in 15-day intervals, on average (at least five days, until 28 days). Treatment was individual in animals classified as Famacha grade three, four or five (according to ocular mucosa pallor intensity). Additionally, from a total of 28 evaluations, 22 were followed by blood collection, for analysis of Packed Cell Volume (PCV), and 20 by individual stool collection for Faecal Egg Count (FEC) and faecal culture.

The feces were collected from the rectum of sheep and then analyzed by modified McMaster method (Gordon & Whitlock 1939) for the determination of FEC. Infective larvae were recovered and identified according to Roberts & O'Sullivan (1950). Blood samples were collected from the jugular vein in vacuum tubes containing anticoagulant, for determining haematocrit percentage.

Chemical control of nematode parasites in sheep were promoted with anthelmintics of salicylanides (closantel) or imidazotiazois (levamizole) classes, based on the history of resistance in this farm.

Spearman correlation coefficient was calculated using BioEstat 5.0 so as to investigate the relationship between the degree Famacha, PCV and FEC. Mean and standard deviation of FEC were calculated.

RESULTS AND DISCUSSION

Based on the results of faecal culture, *H. contortus* was the predominant gastrointestinal nematode, with an average of 96%, followed by *Trichostrongylus* spp. This was also observed by Kaplan et al. (2004), in 27 farms in the south of the USA. This same result was observed in Passo Fundo, Rio Grande do Sul, Brazil, by Vieira et al. (2008). From a total of 587 readings using Famacha chart, the lowest FEC means were recorded in animals whose classifications were Famacha grades one and 2 (Table 1). The number of readings correctly performed was greater than 80%, similarly to that described by Molento et al. (2004) and Kaplan et al. (2004), while less than 1% of the animals which had to be treated were not (Table 2). When considering PCV

Table 1. Mean and standard deviation of EPG (Eggs Per Gram) per Famacha score in sheep.

Famacha score	n*	Average**	Standard deviation**
1	219	444	1157
2	248	840	2234
3	92	1838	3797
4	25	3801	5188
5	3	6533	8151

*n - Number of observations; ** Data without transformation.

Table 2. Absolute and relative frequency (in parenthesis) of false negatives, false positives and correct treatment recommendations, considering the ranges of values of PCV (Packed Cell Volume) based on treatment of sheep by Famacha method.

PCV (%)	False negative	False positive	Correct treatment	Total
<19	4 (0.64%)	-	14 (2.24%)	18 (2.88%)
20-29	-	72 (11.53%)	102 (16.35%)	174 (21.88%)
>29	-	46 (7.37%)	386 (61.86%)	432 (69.23%)
Total	4 (0.64%)	118 (18.9%)	502 (80.45%)	624 (100%)

Incorrect treatment when score for ocular mucosa coloration was between three, four and five, but PCV was greater than 19 (false positive), and when the score for ocular mucosa coloration was one or two and PVC less than or equal 19 (false negative).

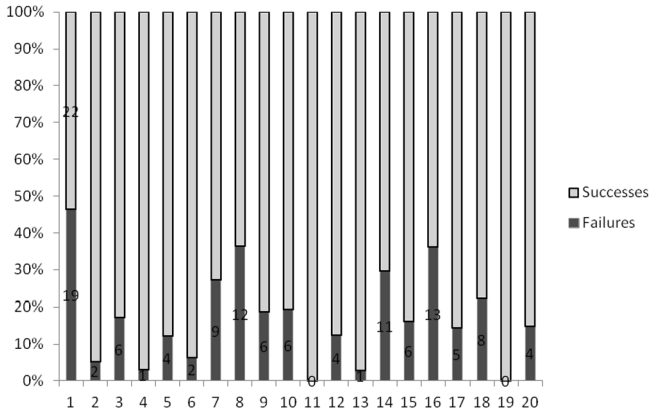

Figure 1. Percentage of successes and failures from the first to the last Famacha examination, based on the hematocrit (%) of animals (PCV ≥ 20 corresponds to Famacha grades one and two; PCV ≤ 20 corresponds to Famacha grades three, four and five).

≥ 20, corresponding to Famacha grades 1 and 2, and PCV ≤ 19, corresponding to Famacha grades three, four and five, it was observed that about 50% of misreadings occurred in the first analysis, while, in all other readings performed during the period, errors occurred with a frequency less than 25% (Figure 1). It was also observed a reduction in the number of treated animals when Famacha method was evaluated in a study in Umuarama, PR, which showed a frequency of 36.7% of animals that did not require treatment in the first examination (Molento et al. 2004). There was negative correlation (r = -0.45, p ≤ 0.05) between Famacha and PCV, as

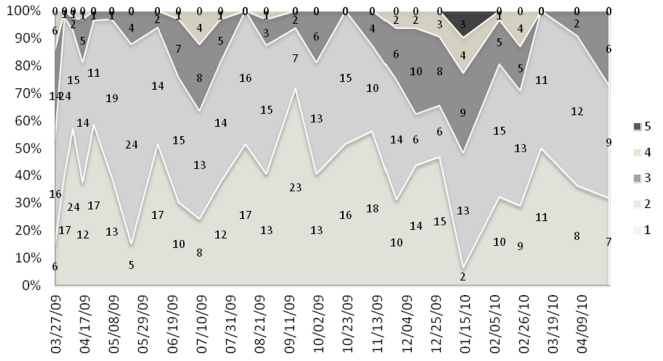

Figure 2. Relative frequency of sheep evaluated during 24 months by Famacha method, regarding the color of ocular mucosa.

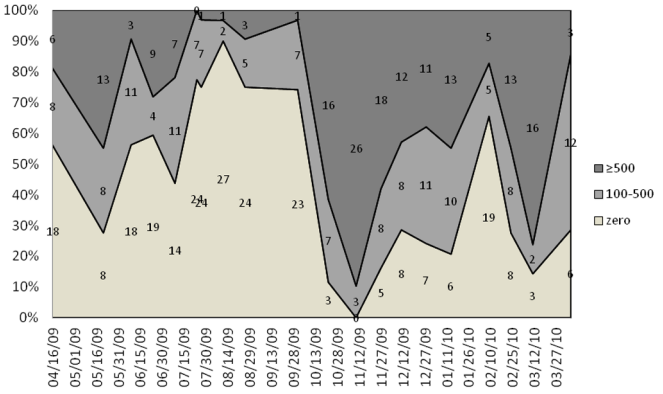

Figure 3. Percentage of sheep examined for FEC score during 24 months of assessment.

well as low positive correlation between Famacha and FEC (r = 0.19, p ≤ 0.05), corroborating results of Molento et al. (2004). The analysis also showed negative correlation between FEC and PCV (r = -0.38, p≤ 0.05). Kaplan et al. (2004) found values of correlation coefficient very similar to those described in this paper; however, they considered high the correlation between FEC and Famacha. Malan et al. (2001) also observed a high correlation and an increase on the accuracy of the method at each evaluation.

During the months of October 2009 to January 2010, it was observed an increase of animals whose mucosa coloration score was above three; in January, it was found the greates number of Famacha grade five animals (pale pink and white mucosa) - indicating high degree of anemia (Figure 2). The higher temperatures in these months - with January being the hottest month - might have contributed to the increase in the number of infectious forms of gastrointestinal nematode. During this same period, there was a greater proportion of animals with eggs per gram (EPG) above 500; in March, approximately 70% of these animals presented EPG above 800 (Figure 3), but only in March 2010 about

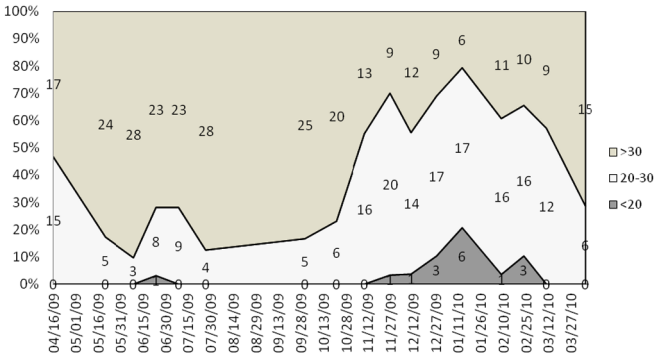

Figure 4. Percentage of sheep examined for Packed Cell Volume (%) during the period from April 2009 to March 2010.

25% of Famacha grade three sheep were registered, to which anthelmintic treatment was indicated (Figure 2). Regarding the packed cell volume, in this same period it was recorded animals with VG ≤ 20% (Figure 4). Molento et al. (2004) considered the months of October, November and January as the months with the greatest parasite challenges for sheep. According to Van Wyk & Bath (2002), there is a seasonality in the frequencies of Famacha grades during the year. For the climatic and environmental conditions of the local they studied, February and March were the months in which an increase of treated animals was registered; these animals were classified as Famacha grade three.

During the period no deaths caused by worms were recorded. Only one sheep did not need treatment AH and five of them received only one indication of treatment.

CONCLUSIONS

Famacha method is a complementary alternative for the selective control of nematode parasites in sheep, reducing the number of anthelmintic applications and preserving the population of parasites in refugia

Acknowledgements. Special thanks to Rossana Leitzke Granada for help with the work.

REFERENCES

Echevarria F., Borba M.F., Pinheiro A.C. & Waller P.W. The prevalence of anthelmintic resistance in nematode parasites of sheep in southern Latin America: Brazil. *Vet. Parasitol.*, 62:199-206, 1996.

Gordon H.McL. & Whitlock H.V. A new technique for counting nematode eggs in sheep faeces. J. *Communw. Sci. Indst. Org.*, 12:50-52, 1939.

Kaplan R.M., Burke J.M. & Terril T.H. Validation of the Famacha© eye color chart for detecting clinical anemia in sheep and goats on farms in the southern United States. *Vet. Parasitol.*, 123:105-120, 2004.

Malan F.S., Van Wyk J.A. & Wessels C.D. Clinical evaluation of anaemia in sheep: early trials. *Onderstepoort. J. Vet. Res.*, 68:165-174, 2001.

Molento B.M., Tasca C., Gallo A., Ferreira M., Bononi R. & Stecca E. Método Famacha como parâmetro clínico individual de infecção por *Haemonchus contortus* em pequenos ruminantes. *Cienc. Rur.*, 34:1139-1145. 2004.

Roberts F.H.S. & O´Sullivan J.P. Methods for egg counts and larval cultures for strongyles infesting the gastrointestinal tract of cattle. *Aust. Agric. Rec.*, 1:99-102, 1950.

Van Wyk J.A. & Bath G.F. The Famacha© system for managing haemonchosis in sheep and goats by clinically identifying individual animals for treatment. *Vet. Res.*, 33:509-529, 2002.

Vieira M.I.B., Rocha H.C., Ractz L.A.B., Nadal R., Moraes R.B. & Oliveira I.S. Comparação de dois métodos de controle de nematódeos gastrintestinais em borregas e ovelhas de corte. *Semina: Cienc. Agri.*, 29:853-860, 2008.