EVALUATION OF THE ANAEMIA SCORING FAMACHA© CHART IN GOATS OF KERALA

Anumol Joseph[1], P. V. Tresamol [2], Stella Cyriac[3] and Ammu Ramakrishnan[4]
Department of Veterinary Epidemiology and Preventive Medicine.
College of Veterinary and Animal Sciences, Mannuthy,Thrissur, Kerala, India, 680651.

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Abstract

FAMACHA© system is a chart based grading methodology to detect anaemia by observing the colour of the conjunctiva of goats and sheeps. In the present study the FAMACHA© system is evaluated in goats of Kerala. The study was performed in goats (n =51) of various breeds and age groups, positive for strongyle infection identified earlier by faecal sample examination. The color of the ocular conjunctiva of all animals were scored on a one to five scale using the FAMACHA© card, and blood samples were collected from each animal for determination of VPRC. Faecal samples were also collected from these animals and eggs per gram (EPG) of faeces were estimated. Correlations between VPRC and eye scores, between EPG and eye scores were estimated. Data for both FAMACHA© scores and VPRC were evaluated using the criteria for anemia: eye score values of three, four and five and PCV values of ≤22 were considered anemic. The VPRC of animals under category A1 ranged from 29 to 36, B2 from 23 to 28, C3 from 18 to 22, D4 from 13 to 17 and E4 from 4 to 11 per cent. Out of the 51 animals screened, 14 (27.40 per cent) of the animals were in D4 group, 12 (23.50 per cent) in E5 group, 10 animals (19.60 per cent) in B2 group, 9 (17.64 per cent) in C3 group and 6 animals (11.76 per cent) were in A1 group. Results indicated that group A1 and B2 did not require treatment for strongylosis, which meant that unnecessary de-worming of 31.37% of the animals could be avoided. Animals with lowest egg count had the highest range of VPRC and vice versa. Any trained farmer can use the FAMCHA© chart effectively in their farms to control the menace of Haemonchus. This system works best under resource-poor conditions and in those places where infections with Haemonchus contortus reach lethal levels quickly. Our study reveals that the FAMCHA© system is easily adoptable and best suited for Indian conditions.

Key words: *Goat anaemia, FAMACHA© system, Strongylosis, Haemonchosis*

Recent studies on sheep and goat farms indicate that multiple anthelmintic resistances in *Haemonchus contortus* are becoming a severe problem (Scheuerle, 2009; Schnyder *et al*., 2005; Yadav *et al*., 1995). Though many factors are involved in the evolution of resistance, the proportion of the

1. Assistant Professor
2. Professor and Head
3. Assistant Professor, Dept. of poultry science
4 .Veterinary surgeon, AHD
Corresponding author's e-mail: pvtresamol@yahoo.co.in

parasite population under drug selection is believed to be the single most important factor influencing the development of resistance. Therefore, where prevention of resistance is an important parallel goal of worm control, it is recommended to leave a portion of the animals untreated. Recently, a novel system called FAMACHA© was developed by Dr. Faffa Malan in South Africa, which enables clinical identification of anemic sheep and goats. Since most studies validating the FAMACHA© method have been performed in South Africa, it is important that the method be tested in other regions before its use is broadly recommended (Kaplan *et al*., 2004).

In the present study, FAMACHA© system was evaluated in goats of Kerala. The FAMACHA© system works at its best under resource-poor conditions and where infections with *Haemonchus contortus* reach lethal levels more quickly (Vatta *et al*., 2002).

FAMACHA© system uses the comparison of the colour of the ocular mucous membranes of a goats to a colour chart for the classification of the animal into one of five colour categories reflecting the range of anaemia from "A" (healthy) to "E" (severely anaemic). In the latest version of the chart the letters, "A"–"E", have been substituted by the numbers, one to five (Fig 1).

Materials and Methods

The study was performed by testing the FAMACHA© system for standardization in goats (n =51) of various breeds and age groups (from different parts of Thrissur district) which were positive for strongyle infection identified by a previous faecal sample examination. The color of the ocular conjunctiva of all animals were scored on a one to five scale using the FAMACHA© card, and blood samples were collected from each animal for determination of VPRC. Faecal samples were also collected from these animals and eggs per gram (EPG) of faeces were estimated. Correlations between VPRC and eye scores and that between EPG and eye scores were estimated. Data for both FAMACHA© scores and VPRC were evaluated using the criteria for anemia as follows: eye score values of three, four and five and PCV values of ≤22 were considered anemic (Kaplan *et al*., 2004).

EPG of faeces were estimated following the protocol of Hansen (1994). Briefly, one gram of goat dropping was thoroughly mixed with 15ml of water and strained to remove the coarse debris, 0.15ml of the mixture was placed on a glass slide and all eggs in the sample were counted. The count was multiplied by 100 to get the EPG of faeces.

The faecal samples found to be positive by microscopic examination were subjected to faecal culture to identify the strongyle larvae profile in study animals. Larval nematodes were identified on the basis of shape and number of gut cells, relative size of sheath tail and shape of tail (Kaufmann, 1996).

Results and Discussion

Fifty one goats which were found positive for strongyle infection by faecal sample examination were screened for anaemia using the FAMACHA© anaemia scoring chart (**Fig 1**). The range of VPRC in each category of anaemia score is depicted in Table

1. The VPRC of animals under category A1 ranged from 29 to 36, B2 from 23 to 28, C3 from 18 to 22, D4 from 13 to 17 and E5 from 4 to 11 per cent.

Fig. 1. Eye Score E5, identified using the FAMCHA© chart

Out of the 51 animals screened, 14 animals were in D4 group, 12 in E5 group, 9 in C3 group, 10 animals in B2 group and 6 animals were in A1 group (Table 1). Animals grouped under A1 and B2 did not require treatment for strongylosis, so unnecessary deworming of 31.37 per cent of the animals could be avoided.

Table 1. Table showing the VPRC in each category of anaemia, distribution of animals in each category and mean strongyle egg count.

Anaemia score (FAMACHA© score)	VPRC Range	No. of animals (%)	Mean Egg count
A1	29-36 %	6 (11.86)	250
B2	23-28 %	10 (19.60)	650
C3	18-22 %	9 (17.64)	1350
D4	12-17 %	14 (27.40)	2030
E5	≤4-11 %	12 (23.50)	2850

The mean egg counts of strongyles in group A1 and B2 were comparatively lower than the other three groups. The mean faecal egg count of animals belonging to each category is depicted in the Table 1. Animals with an average faecal egg count of 250 had VPRC >28 per cent, of EPG 650 had a VPRC of 23-27 per cent, of EPG 1350 had a VPRC of 18-22 per cent, of EPG 2030 had a VPRC of 13-17 per cent and of EPG 2850 had a VPRC ≤12 per cent. In short, animals with lowest egg count had the highest range of VPRC and *vice versa* (Fig. 2). There is an inverse relationship between these two variables with a correlation coefficient of -0.84.

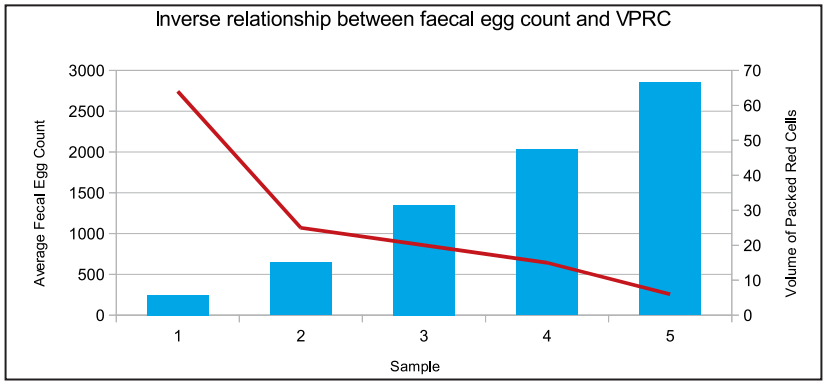

Fig. 2. Plot showing the inverse relationship between fecal egg count and volume of packed red cells, the mid value of the VPRC range (in %) was chosen to plot the line (scale on the right Y-axis); r = - 0.84.

Faecal samples from 10 strongyle infected animals were subjected to culture and the L3 stage larvae were identified by micrometric measurements. Eighty per cent of the cultures revealed more than one species of strongyles. Among those larvae identified, the predominant species was *Haemonchus* which were present in 70 per cent of the cultures. Other species found were *Bunostomum, Trichostrongylus* and *Nematodirus* (Table 2).

Table 2. Prevalence of Strongyle larvae by faecal culture

Strongyle species	No. positive	Percentage of occurrence
Haemonchus	7	70
Bunostomum	4	40
Trichostrongylus	4	40
Nematodirus	1	10
TOTAL	10	

Fifty one goats which were found positive for strongyle infection by faecal sample examination were screened for anaemia using the FAMACHA© chart. The cutoff value of VPRC was decided as 22 per cent in the present study as done by Kaplan *et al*. (2004). The VPRCs of animals in all categories were as per the previous reports. Only two per cent of the animals showed variation from the standard range. Eye scores of C3, D4 and E5 are recommended for treatment as per this study and as suggested by Kaplan *et al*. (2004) who also opined that none of the animals would miss the necessary treatment by following this pattern.

FAMACHA© is only a component of a good management program for *Haemonchus* and cannot be used on its own. A good integrated control program using smart drenching principles must be used. *Haemonchus* is by far

the most important cause of anaemia in goats and sheep; however, there are other causes of anaemia that could cause misdiagnosis (Liver fluke, external parasite, blood parasites, bacterial and viral infections and nutritional deficiencies).

On examination, 80 per cent of the cultures revealed more than one species of strongyles and the predominant species was *Haemonchus* which was present in 70 per cent of the cultures. Dorny *et al*. (1995) also reported the highest occurrence of *Haemonchus* among strongyles of goats. Other species identified include *Bunostomum, Trichostrongylus* and *Nematodirus.* Similar findings were reported by Kaplan *et al*. (2004).

From the present study, it is evident that gastro intestinal strongyle infection is the major reason of anaemia in goats in the Kerala region, our study also revealed that *Haemonchus* spp*.,* accounts for over 70 per cent of the strongyles infecting goats. Thus, FAMACHA© system could be successfully adopted in our conditions.

On the other hand, as per the OIE disease cards, certain conditions can make the eye's membrane appear deep red in colour than expected thus masking the presence of anaemia (any fever, infectious eye diseases, circulatory failure, hot and dusty conditions which irritate eye,). Our experience shows that these biases could be easily overcome by a trained person.

The mean egg count of strongyle in group A1 and B2 was comparatively lower than the other three groups. The average egg counts in categories A1, B2, C3, D4 and E5 were 250, 650, 1350, 2030 and 2850 respectively. This shows the significance of skipping the deworming treatment in those groups.

Our study also reveals that in animals with a normal range of VPRC, *Haemonchus* was unable to produce its pathogenic effect (anaemia). Taking our results into account, groups A1 and B2 did not require treatment for strongylosis, thus treatment for 31.37 per cent of the animals could be avoided. This methodology could be thus useful to identify only the severely affected animals and thereby reducing the chance of anthelmintic resistance.

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References

Dorny, P., Symoens, C., Jalila, A., Vercruysse, J. and Sanib, R. 1995. Strongyle infections in sheep and goats under the traditional husbandry system in peninsular Malaysia. *J. Vet. Parasitol.* **56**: 121-136.

Hansen, J. 1994. *The epidemiology, diagnosis and control of helminth parasites of ruminants.* ILRAD, Nairobi, Kenya.

Kaplan, R.M., Burke, J.M., Terrill, T.H., Miller, J.E., Getz, W.R., Mobini, S., Valencia, E., Williams, M.J., Williamson, L.H., Larsen, M. and Vatta, A.F. 2004. 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.

Kaufmann, J. 1996. *Parasitic Infections of Domestic Animals, a Diagnostic Manual*. Birkhauser Verleg, Germany, 423p.

Scheuerle, C.M. 2009. Anthelmintic resistance of *Haemonchus contortus* and the FAMACHA© -method as a tool to delay the development of anthelmintic Resistance. PhD Thesis, Ludwig-Maximilians-Universitat München, 100p.

Schnyder, M., Torgerson, P.R., Schonmann, M., Kohler, L., Hertzberg, H. 2005. Multiple anthelmintic resistance in *Haemonchus contortus* isolated from South African Boer goats in Switzerland, *Vet. Parasitol.* **128**: 285-290.

Vatta, A.F., Krecek, R.C., Letty, B.A., Vanderlinde, M.J., Grimbeek, R.J., de Villiers, J.F., Motswatswe, G.S., Molebiemang, G.S., Boshoff, H.M. and Hansen, J.W. 2002. Incidence of *Haemonchus* spp. and effect on haematocrit and eye colour in goats farmed under resource-poor conditions in South Africa. *Vet. Parasitol.* **103**: 119-131.

Yadav, C.L., Kumar, R., Uppal, R.P., Verma, S.P. 1995. Multiple anthelmintic resistance in *Haemonchus contortus* on a sheep farm in India, *Vet. Parasitol.* **60**: 355-360. ■