

Relationship Between Gastrointestinal Parasite Infection and Faecal Protein Excretion in Moghani ewes

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Abstract: The aim of this study was to investigate relationship between Faecal Egg Counts (FECs) and protein excretion in naturally acquired nematode infected Moghani ewes. Thirty-five Moghani ewes (aged from 6 to 12 months and average of body weight 32 ± 3 kg) were selected among the naturally acquired nematode infected animals which their infection had confirmed by McMaster flotation method. The animals were divided into 5 groups according to the FECs (<320, 320-370, 370-420, 420-470 and >470). Faecal samples were taken directly from the rectum of each animal in early morning and kept in individual sampling containers under 4°C. Faecal parameters such as Crude Protein (CP), Dry Matter (DM), Organic Matter (OM) and ash were determined using the Kjeldahl method following the standard procedures. Data were processed in excel and statistical analysis was performed using SPSS/ver. 17 software. Our data indicates that there was a significant difference among groups for the faecal ash and OM values ($p < 0.05$) in the studied animals. Also, we observed a significant correlation between the ash and OM values ($p < 0.001$, $r = -0.952$). In addition, there was a negative but not significant correlation between the FECs and CP values ($p > 0.1$, $r = -0.290$) in the naturally acquired nematode infected Moghani ewes. In conclusion, the FECs was not a good indication for interpretation of faecal protein excretion in nematode infected sheep.

Key words: Gastrointestinal parasites, nematode, faecal protein, Moghani ewes

INTRODUCTION

The effects of gastrointestinal parasites (GIP) in small ruminants are well documented. These animals contribute in food security and income of resource-poor families in most developing countries such as Iran. Some constraints to production of small ruminants are including: a wide range of diseases, poor nutrition and internal and external parasites which among them, GIP (particularly nematodes) and poor nutrition plays a key role. Nematodes usually lives in the gastrointestinal tract (GIT) of the host and cause to impact on the sheep industry (Max, 2010). Internal nematodes impact the economy of sheep industry directly by the annual cost of the anthelmintic treatment and indirectly by the decreasing of body weight, wool and milk production (Dominik, 2005). The above mentioned infections can increase the protein requirements in sheep (Holmes, 1993). Additionally, these parasites may cause to increase of pH and reduce nutrient digestion in abomasum (Scott *et al.*, 1998). Helminthes infections are one of the most common form of GIP infection in small ruminant which results to constraint of sheep production in Moghan plateau, Ardebil province, Iran. This area is one of the feeder poles in Iran. Many species of nematode such as *Haemonchus* and

Trichostrongylus were found in Moghan plateau, that are associated with production loss and clinical diseases (Eslami and Nabavi, 1976). Overall, Gastrointestinal Nematodes (GIN) caused to lose weight, decrease of voluntary feed intake, Feed Conversion Ratio (FCR), palatability, wool production, fertility and in high quantities resulted to metabolic disease, anemia, diarrhea, bloody faeces, and mortality by damage to the lumen endothelium. The GIN infectious cause to loss and excretion of protein from the intestinal lumen and impact the protein metabolism in small ruminants (Eslami, 1997). The infection with *H. contortus* and loss of blood into the abomasum does not necessarily impair the metabolic protein supply, because the postabomasal processes compensate its complications (Abbott *et al.* 1984). The high performance is observed in all the animals when they are able to absorb maximum amount of the diet protein, that lead to increase in the flux of essential amino acids to small intestine and followed by increasing the absorption of these components to blood circulation. The absorbed amino acids is used to product of different metabolic components such as enzymes, hormones, immunoglobulin against the pathogen agents, meat, wool or provide fetus requirements during the pregnancy (Waghorn and Shelton, 1997). The main parts of dietary

Table 1: The Mean±SD of studied faecal parameters in naturally acquired nematode infected Moghani ewes.

Group	N	FECs per gr faeces	CP (%)	DM (%)	OM (%)	Ash (%)
1	6	<320	13.50±0.31	32.80±1.21	75.74±0.40 ^b	24.26±0.40 ^a
2	7	320-370	13.02±0.33	34.13±1.69	77.01±0.97 ^a	23.01±0.92 ^b
3	7	370-420	13.19±0.35	32.95±0.98	77.05±1.21 ^a	22.61±1.14 ^b
4	6	420-470	13.12±0.22	33.53±0.94	77.05±1.21 ^a	22.16±0.87 ^b
5	6	>470	13.16±0.39	33.40±1.28	76.88±1.10 ^a	23.05±1.10 ^b

There are significant differences between groups with different codes in a column (superscript letters a and b; p<0.05). SD= standard deviation, CP = crude protein, DM = dry matter, OM = organic matter, FECs = faecal egg counts, gr = gram

Table 2: Correlation coefficients and statistical analysis between the studied parameters for total samples (n = 35)

	FECs	DM	CP	Ash	OM
FECs	1	0.075	-0.290	0.071	-0.069
DM		1	-0.118	-0.307	0.329
CP			1	0.047	-0.050
Ash				1	-0.952**
OM					1

** : p<0.01, correlation is significant (two - tailed)

protein is degraded in the rumen and used by its microorganisms or a little passed in undegraded form through the faeces (bypass protein). When the efficiency of microbial protein synthesis is high, content of faecal protein (FPC) will be lower in the normal animals (Van Houtert *et al.*, 1996; Hoste *et al.*, 2002). Likewise, any damage to GIT due to metabolic disorders, reduce digestibility and utilization of protein, amino acids and carbohydrates, and also result to decrease of some minerals absorption, especially phosphorus in ratio. A common feature of many parasitic GI infections is an increased loss of endogenous protein into the GIT (Holmes, 1993); subsequently, lead to decrease N retention and deposition of protein in the body. Although, some reports demonstrated that the faecal N losses unchanged or had a little difference in infected sheep compared to the non-infected animals (Rowe *et al.*, 1988; Thamsborg and Agergaard, 2002). Similar to the faecal N, the percentage of DM is higher in nematode infected sheep which were fed on pastures (Thamsborg and Agergaard, 2002). The objective of this study was investigating relationship between FECs and faecal protein and excretion other components in naturally acquired nematode infected Moghani ewes.

MATERIALS AND METHODS

This experiment was carried out at the Moghan plateau, Ardabil province, northwest of Iran (30°24'35.47" N and 48°18'12.36" E and 98M altitude) in summer. Faecal samples were taken from 250 free grazing Moghani ewes with no any anthelmintic therapy at the last 4 months. The faecal samples were collected from the rectum of all animals, directly, then the McMaster flotation technique was performed for finding GIN infection in these samples (Urquhart *et al.*, 1987). Thirty-five infected and non-pregnant ewes (aged from 6 to 12 months and average of body weight 32±3 kg) were selected among the naturally acquired nematode infected animals and divided in 5 groups according to the FECs (<320, 320-370, 370-420, 420-470 and > 470). Similar to previous, faecal samples were taken directly from the

rectum of each animal in early morning (at 6 to 8 A.M.), kept in individual sampling containers under 4°C and carried out to laboratory of parasitology at the Islamic Azad University, Shabestar branch, as soon as; then the FECs was determined using the McMaster flotation technique (Urquhart *et al.*, 1987) and other faecal parameters such as CP, DM, OM and ash were determined by the Kjeldahl method following the standard procedures (AOAC, 1990) at the food analyzing laboratory of the Islamic Azad University, Shabestar branch. The data were analyzed by one-way analysis of variance and Pearson's correlation method using SPSS / ver. 17 software, and Duncan's multiple range tests was used to detect significant differences between the means. All values shown as mean±standard deviation (SD).

RESULTS AND DISCUSSION

The mean±SD of FECs and other parameters in naturally acquired nematode infected Moghani ewes are shown in Table 1. Correlation coefficients between all the measured parameters are presented in Table 2.

The majority size of the obvious gastrointestinal eggs in the examined faecal samples using scaled microscope were between 70-90 µm. These eggs size were consistent with ones of *Trichostrongylus*, *Ostertagia*, *Marshallagia*, *Haemonchus* and *Nematodirus* genus. Nematode infection is one of the commonest problem in tropical regions (Eslami, 1997; Athanasiadu, 2001). In GIP infections, protein loss are marked particularly through the faeces. Previous researches demonstrated that the amount of leaving non-reabsorbable endogenous nitrogen from the ileum of GIP infected sheep can be reached up to 4-5 g N/day (Coop and Kyriazakis, 2001). According to our results from the Moghani ewes, protein excretion through the faeces were higher in all the infected animals to GIP; but, there was no a significant difference among groups. This results was consistent with previous report in sheep (Rowe *et al.*, 1988). Excreted protein has 2 sources in small ruminants; endogenous and dietary undigested protein. The GIP cause to increase digestive enzyme and gastrointestinal secretory substances, also parasites have

decreasing effect on degradation and absorption of proteins by damage to GIT. Nematode infection could change physiological structure of the lumen by creation lesions in endothelium. Majority of the parasites live in the abomasum and cause to proliferation of epithelial cells. Then, the blood proteins especially albumin leakage into the abomasum and macromolecules such as proteins couldn't absorb (Murray *et al.*, 1970). Although, in this study, we showed a negative but not significant correlation between the FECs and CP% values; and its variations was not only related to the FECs. It seems, additional agents are involved in protein excretion from the faeces. These agents can be including: dietary status, the rate of endogenous protein production, worms fecundity (utero eggs per female nematode), hatch rate and larval development in faeces (Butter *et al.*, 2000; Min and Hart, 2003). In this study, we found a non-significant difference between groups; but, the DM % were higher with increasing the FECs in Moghani ewes which were fed by free grazing in pastures of Moghani plateau. Our result was consistent with the Thamsborg and Agergaard (2002) report in sheep. Additionally, the highest and lowest levels of OM % and ash were observed in group 1, respectively. This finding demonstrated that there was a reverse correlation between them which it seem normal. Our results indicates that the FECs had a little effect on OM % and ash values in Moghani ewes, and probably, diet composition had a key role in this situation. In conclusion, the results of this study revealed that there was not a significant correlation between the FECs and faecal N losses in sheep, as well as, the evaluating of faecal CP % is not a good indication for determining the load of parasite infection in small ruminants.

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