

Degradation and outflow rate of protein supplements in the rumen of dry and lactating ewes and goats

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Six dry Chios ewes and 6 dry Damascus goats an average weight of 58.1 and 60.0 kg, respectively were used in experiment 1. Animals were fed 42.8 g feed DM/kg^{0.75} composed (kg/kg) of 0.46 kg concentrate and 0.54 kg barley straw. In another experiment, 6 lactating Chios ewes and 6 lactating Damascus goats with an average live weight of 64 and 60 kg, respectively were used. They were given 129.2 and 125.6 g feed DM/kg^{0.75}, respectively. The feed composed (kg/kg) of 0.71 concentrate, 0.17 barley hay and 0.12 lucerne hay. At the end of a 14 day adaptation period, each animal was dosed with 40 (expt. 1) or 50 g (expt. 2) of Cr-treated soybean meal. Rectal grab samples were then taken over a 90 h period at 6 h intervals starting 12 h after labelling. Soybean meal was treated with sodium dichromate as outlined by Elimam and Ørskov (1984, *Anim. Prod.*, vol. 38, p. 45). Mean fractional outflow rate (% per h) of Cr-treated soybean meal from the rumen was taken as the slope of the regression line calculated from the regression equation of natural log faecal Cr concentration and time. It was suggested that Cr-treated particles behaved in a similar way to original ones. Treatment of soybean with Cr resulted in a decrease of DM losses from dacron bags incubated in the rumen of sheep and goats for 40 h (untreated 0.610 v treated 0.089). Outflow rate of small particles (% per h) from the rumen of the two species was similar (dry ewes 5.4, dry goats 5.7; lactating ewes 8.6, lactating goats 8.1). Higher outflow rates from the rumen of animals offered high rather than low roughage diets has been reported by some authors. Thus, the higher values obtained in lactating compared to dry animals should be associated with the level of intake.

In another experiment, the *in situ* degradation of fish meal (FM) and soybean meal (SBM) was measured in the rumen of 3 Chios ewes and 3 Damascus goats fed *ad libitum* on 200 g concentrate, 200 g lucerne hay and straw. Nylon bags were incubated for 2, 6, 16, 24 and 32 h. There were no differences between ewes and goats for effective DM (EDM) and CP (ECP) degradability (degradability values at various incubation periods combined mathematically with outflow rates of small particles from the rumen) within supplements (outflow rate 5%/h: SBM-EDM ewes 37, goats 39; ECP ewes 27, goats 28; FM-EDM ewes 32, goats 37; ECP ewes 38, goats 39%).

Key words : Ewes, goats, outflow rate, degradability.

Effect of protein source on performance of lactating Chios ewes and Damascus goats, and degradability of protected and unprotected soybean meal in the rumen of goats

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Two trials, one involving 36 twin suckling Chios ewes and the other 32 twin suckling Damascus goats were conducted to study the effect of protein source (fish meal vs soybean meal) on preweaning milk yield and its composition and growth performance of offspring. Feed supply (kg/day) of ewes consisted of 2.36 concentrate, 0.41 lucerne hay (247 g CP/kg DM) and 0.56 barley hay (80 g CP/kg DM); the corresponding values for goats were 2.18, 0.31 and 0.61, respectively. The concentrate mixtures were in pelleted form. The control (C) concentrate mixture in both trials was composed (kg/t) of 736 barley grain, 195 soybean meal (SBM), 50 wheat bran, 5 dicalcium phosphate, 10 limestone and 4 NaCl. In the ewe trial, SBM was totally replaced by

fishmeal (FM) (121 kg FM and 74 kg barley grain/t), whereas in the goat trial, FM mixture (FG) was composed (kg/t) of 769 barley grain, 112 SBM, 50 FM, the other ingredients remaining the same as in the control mixture. CP (g/kg DM) content was 201, 194 and 199 for C, FE and FG mixtures, respectively. DM and CP degradation of the 3 concentrate mixtures were measured using nylon bags incubated in the rumen (2, 6, 16, 24 and 32 h) of 3 Damascus goats. There were no significant differences between mixtures for DM or CP effective (degradability values at various incubation periods combined mathematically with outflow rates (5%/h) of small particles from the rumen) degradability values (C : DM 51.7, CP 45.0 ; FM : DM 50.8, CP 38.3, FG : DM 53.1, CP 46.4 %).

Milk yield of ewes fed fish meal (FE) was significantly ($P < 0.05$) higher than that of those fed the C diet (FE 3.84 vs C 3.44 kg/day). There were no difference between treatments in ewe milk fat (C 44 vs FE 43 g/kg) or protein content (C 54 vs FE 53 g/kg), whereas milk yield of goats was similar in the two treatments (C 3.87 vs FG 3.82 kg/day). However goats fed FM produced milk with a higher fat (C 32 vs FG 36 g/kg) and protein (C 38 vs FG 41 g/kg) content. Except a better conversion (milk/gain ratio) efficiency (C 5.17 vs FE 4.44) of male lambs of suckling ewes fed the fish meal diet, no other difference on the performances of lambs or kids was observed. Lambs consumed less milk than kids (Lambs : males 4.69, females 5.13 ; kids : males 6.63, females 6.98) per unit of bodyweight gain.

In another trial, different levels (0, 0.3, 0.6 or 0.9 g HCHO/100 g SBM) of 40 % formaldehyde were used for treating SBM. Treated SBM was stored in sealed polyethylene bags for 1 or 5 days. Bags were then opened and treated SBM was laid onto a plastic sheet forming layers of 2.5 cm depth and left exposed for 72 h. Treated and untreated SBM were incubated into the rumen of 3 Damascus goats for 8 and 24 h for determination of dry matter (DM) and crude protein (CP) disappearance (D). Increasing levels of HCHO reduced DM and CP D. Mean DM and CP disappearance of the two incubation periods was : control : 50.0, 32.2, 0.3 HCHO : 41.0, 14.5, 0.6 HCHO : 37.0, 10.7 ; 0.9 HCHO : 33.0, 10.4 %. Storage period did not affect D, but both DM and CP were increased with prolonged incubation periods (8 h : 34.5 ; 13.0 ; 24 h : 45.5 ; 21.6 %).

Key words : Ewes, goats, protein source, formaldehyde treatment, milk yield.

Nitrogen flows in the gut of dairy goats : quantitative and qualitative aspects

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Nitrogen flows were measured in the gut of two lactating goats (2 kg milk per day) fitted with a simple rumen and a duodenal cannula and housed in metabolic crates. They were fed *ad libitum* in two equal meals during 30 days for each diet. The diets consisted of green roughage (ray-grass = RGA) and concentrates or maize silage (M) or a mixed diet (hay, dried beet pulps, concentrates = HPC). The OM, CP and CF contents (% DM) were 83.9, 92.8, 94.9 and 14.0, 12.0, 7.8 and 30.3, 24.5, 22.7 respectively for RGA, HPC and M diets. PDIN and PDIE values were 104 and 105, 52 and 83, 107 and 115 g/kg DM respectively for RGA, M and HPC diets. Digesta flows were estimated on the 21th day using PEG (30 g/day) and chromic oxide (2 g/day) as markers. Microbial fraction was calculated after determining RNA level in duodenal digesta and $N_{RNA}/totalN$ ratio of bacteria isolated by differential centrifugation of duodenal content.

The amount of ingested dry matter was 1 777, 1 538, and 771 g respectively for HPC, RGA and M diets. With HPC and RGA diets the amounts of ingested nitrogen (34.9 and 39.1 g/day) was higher than the nitrogen entering the duodenum (22 and 30 g/day). Net nitrogen recycling into the rumen seemed to be very important (+ 15 g/day) with M diet.

Microbial nitrogen/NAN ratio in the duodenum varied between 50 % (M), 68 % (HPC) and 80 % (RGA). The mean flow of N_{RNA} (2.4, 2.3, and 1.6 g/day) for HPC, RGA and M was 1.8 fold higher than the ingested amount showing net synthesis of RNA in the rumen. Microbial efficiency synthesis (g microbial CP/kg DOM) varied between 109 for HPC, 159 for M, and 161