FEED MANIPULATION IN THE SMALL RUMINANT TO PRODUCE HEALTHY LEAN MEAT

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Introduction

The low acceptability of mutton by consumers have been attributed to its high saturated fatty acid content, which may produce health risks. It has been shown that polyunsaturated fatty acids (PUFA) possess beneficial activities in both human and animal health. As the main dietary PUFA sources are plants, herbivores are relatively rich in PUFA except ruminants due to the extensive biohydrogenation of PUFA in the latter. Biohydrogenation of about 90 % polyene acids occur in the rumen mediated by the rumen flora. Hydrogenation of unsaturated fats can be reduced through various feeding and metabolism manipulations. These efforts will therefore facilitate PUFA enrichment in animal tissues, resulting in less saturated meat and improved carcass quality, which benefits the consumer and the animal industry. Thus, this project focused on the manipulation of fatty acid metabolism in the gastrointestinal tract of small ruminants to produce healthy lean meat, by feeding mixtures of different levels of oil palm frond (OPF) pellets as the main source of fibre, and commercially available sheep and goat pellets (commercial pellets).

Materials and Methods

Three groups of male lambs (14 animals per group) were used for the trial, which was conducted for 14 weeks (inclusive of two weeks of adjustment period). The first group (OPF) was fed a mixture of 80 % (w/w) OPF and 20 % (w/w) commercial pellets. The second group (HAF) was fed 50 % (w/w) OPF and 50 % (w/w) commercial pellets, while the third group (CON) was fed 80 % (w/w) commercial and 20 % (w/w) OPF pellets. The feeds were provided according to 3 – 3.5 % bodyweight of dry matter intake. Blood and feeds were sampled weekly. Upon slaughter, specific muscle samples, offal organs and rumen contents were taken for analysis. The fresh blood samples were tested for cholesterol, triglyceride and high-density lipoprotein (HDL) levels. Fatty acid profiles of the plasma, red blood cells, tissues and feedstuffs were determined by gas chromatography after lipid extractions. Proximate analyses of the feedstuffs were carried out to monitor nutrient intake patterns. The pH, ammonia nitrogen and volatile fatty acid (VFA) contents of the rumen liquor were also measured. The carcass quality was also assessed.

Results and Discussion

Preliminary results showed that the CON group recorded the highest average daily gain out of 118 g compared to the HAF group (77 g) and the OPF group (35 g). This was not surprising since OPF pellets contained high amounts of fibre compared to commercial pellets. The total plasma cholesterol and triglyceride levels for all the three groups showed no significant differences. However, the plasma HDL for the OPF group showed a 22.5 % increment compared to a drop of 1 % in the CON group based on respective initial values. The fatty acid profiles at week eleven showed that although the OPF group had the most total saturated fatty acids (298 ug/ml plasma) and total unsaturated fatty acids (460 ug/ml plasma), the percentage of total unsaturated fatty acids over the total fatty acids were similar for all the three groups ranging from 60 to 63 %. The total omega-3 PUFA was also higher in the OPF group at week eleven (51.87 ug/ml plasma) compared to 46.8 ug/ml plasma for the HAF group and 40.4 ug/ml plasma in the CON group. In contrast, the total omega-6 PUFA levels were similar for all the three groups throughout the trial. The results for rumen content assays, feedstuff / meat proximate analyses, meat / offal organ fatty acid profiles and carcass evaluation are being processed to be reported later.

Conclusions

Preliminary results showed that there were definitely significant changes in both the plasma lipid classes and fatty acid profiles due to the feeding manipulation. The increase in fatty acid unsaturation was somewhat similar in the goat as reported by Rajion et al. (1996). This may lead to possible changes in fatty acid profiles in the ensuing meat products, resulting in lesser saturated fatty acid and higher omega-3 and omega-6 PUFA content, thus yielding a healthier meat for the consumer.

References

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