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Methane emissions of yankasa sheep fed with two different dietary concentrate levels

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Abstract

Measuring methane emissions from ruminants is necessary for developing strategies for its reduction as well as for accounting purposes. Portable accumulation chamber (PAC) is one of the several methods used to measure methane from ruminants. PAC has predominantly been utilised in genetic studies to rank animals with relatively few works using it for nutritional intervention studies. This study therefore sought to measure methane emissions of sheep fed with high concentrate and low concentrate diets as well as to estimate daily methane production in Yankasa sheep using PAC. Eight Yankasa weaner rams arranged in a completely randomised design were fed with a basal diet (65:35 forage to concentrate ratio) and supplemented with either 30 % additional concentrate (high concentrate diet - HCD) or 30 % additional hay (low concentrate diet - LCD) for twelve weeks after which methane was measured. Methane measurement was done using two sampling protocols (single spot and four spots) over eight days where live weight, feed intake, methane output, methane yield, methane intensity were determined. The two sampling protocols were compared. Feed intake on PAC measurement day was compared with feed intake on days before and after measurement. Data were analysed in SPSS using ANCOVA and repeated measures ANOVA. There was a significant effect of diets on methane output per day ($p < 0.05$) and feed intake on measurement day ($p < 0.05$) but not on methane output per live weight, methane yield and methane intensity. Rams fed with HCD had higher feed intake (1.09 vs 0.89 kg) and produced more methane per day (23.83 vs 20.39 g/Day) than rams fed with LCD. Single spot measurement with one hour fasting significantly ($p < 0.01$) recorded higher methane output (26.22 g/Day) compared to four spots measurement (22.11 g/Day). There was no significant difference in feed intake on PAC measurement day and the days before and after it. Given that the four spots sampling protocol accounted for diurnal variation in methane production, the overall mean of daily methane output recorded with this protocol provided a better estimated daily methane production of 22.11 g/Day for Yankasa weaner rams with 0.77 g methane per kg of body weight.

Keywords: Nutrition, portable accumulation chamber, small ruminants

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