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Digestibility, Energy Use Efficiency and Methane Production in Steers Fed at Restricted Levels of Intake

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Abstract

It is well recognised in ruminants that as intake decreases, nutrients absorption efficiency increases. However, studies conducted on animals fed at below Maintenance Energy Requirements (MER) are inconclusive, with some showing an increase, some no change and some even a decrease in apparent total tract digestibility.

To investigate the effects of feeding level on energy utilisation efficiency and enteric methane production, a feeding trial was conducted using Boran steers (n=12, LW=183.3±4.3 kg [SE], age=18 mo). In a randomised block design, steers were fed at 120 %, 100 %, 80 % or 60 % of calculated MER a diet composed mainly of chaffed Rhodes grass hay (dry matter [DM]: 906.5 g kg⁻¹; organic matter [OM]: 915.2 g kg⁻¹; crude protein [CP]: 57.7 g kg⁻¹ neutral detergent fibre [NDF]: 729.3 g kg⁻¹; metabolisable energy [ME]: 8.3 MJ kg⁻¹) for 35d including a 14d adaption period. One sixth of the total energy for the 120 % treatment group was fed in a 48:52 cottonseed meal : molasses mixture. Intakes, refusals, faecal and urine output, and enteric methane production were measured. Statistical significance was set at $p < 0.1$.

Gross energy intake (GEI; MJ/d) differed between treatments ($p < 0.02$), but digestible energy intake (DEI; MJ/d) did not differ ($p = 0.24$) in the 120 % and 100 % MER treatments, but were greater than the intakes for the 80 % and 60 % MER groups ($p < 0.03$). Level of intake did not affect OM or CP digestibility ($p > 0.54$ and $p > 0.38$, respectively). Energy losses through faeces were 44 % of GEI, methane; 8.1 and urinary losses; 2.1 % but these did not differ from one treatment to another. Methane yield (MY) were 24.1, 23.7, 27.0 and 29.64 (± 1.1 PSEM) CH₄ g per kg DMI for the 120%, 100%, 80% and 60% groups, respectively, with the 60% treatment group being significantly different from the 100% treatment group (P=0.09).

The lower DEI and higher energy losses in form of methane emissions at intakes below MER in the present study indicate that energy utilisation in cattle fed below maintenance is not improved and that MY actually increases in cattle fed at low levels.

Keywords: Methane yield, sub-maintenance feeding cattle